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LOUIS PASTEUR*

BY

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I feel that it is a very great honour to have been asked to deliver this lecture on Pasteur, but I accepted the invitation with great trepidation, for I felt that I should be unable to do justice to so memorable a subject. We are grateful to M. Leveille for coming to London and setting up this Pasteur exhibition. I saw it in Paris and was struck then with its comprehensiveness and arrangement. But M. Leveille knows that the genius of Louis Pasteur is revered in Britain as it is in France.

Louis Pasteur was just a citizen of France—not an ordinary citizen, as it turned out; and there was nothing in his origin to indicate that when he died—and 50 years after his death—he would be a national hero. His great grandfather, grandfather, and his father were tanners. Perhaps had circumstances been different one of these ancestors might have become famous, but son followed father in an essential occupation. Pasteur's father, who on the battlefield had been decorated with the Legion of Honour, appreciated the advantages of education, and Louis, instead of becoming a tanner, was admitted to the Ecole Normale in Paris, where he seized with avidity the chances of learning, particularly chemistry and physics, under the distinguished teachers of that institution. He obtained his degree, but even then there was no real indication of his coming fame.

Louis Pasteur in his youth and throughout his life believed in hard work. He lived for his work and put his whole heart and soul into it. His was not a 40-hour week. He worked so constantly in his laboratory that it was inevitable that he became a beautiful technician, and throughout his life he had no use for sloppily performed or ill-conceived experiments. His first momentous discovery was the dissymmetry of crystals. Like many others, he had been puzzled by the difference between tartaric and racemic (or paratartaric) acids. These two chemicals appeared to be identical in every way except that, whereas racemic acid solutions had no influence on polarized light, tartaric solutions rotated this to the right. When Pasteur examined the crystals of a salt of racemic acid with the microscope he noticed that the crystals were not quite identical and could be divided into two groups. In one of these groups a particular facet was on the right side while the other group had the same facet on the left. They were in fact mirror images of each other and might thus be compared with a pair of gloves. Pasteur had vision, and with extraordinary care and perseverance he separated his right- and left-handed crystals into distinct groups. Then he made solutions of these and tested them by the polariscope. The solution of the right-handed crystals deviated the polarized light to the right, the left-handed crystals to the left, and when the solutions were mixed in equal proportions there was no deviation—it was back at the indifferent racemic acid.

A New Science

Pasteur had solved a mystery that had puzzled older and more famous chemists. Little wonder is it that he was excited and rushed out and kissed an attendant whom he met outside the laboratory door. You can imagine the feelings of young Louis Pasteur when later he visited the great Biot to demonstrate his discovery. Biot, like a careful scientist, took no risks. Pasteur was given tartaric acid and the chemicals necessary for its crystallization. He made the solutions, which Biot kept in a cupboard till the crystals had formed. Pasteur separated his right- and left-handed crystals and Biot tested them in the polariscope. It was as Pasteur had said, and we can honour Biot for his immediate remark. "My dear boy, I have so loved science all my life that this makes my heart beat." From that day Biot was Louis Pasteur's friend and helper.

But he was not to stay in Paris uninterrupted. He was sent to Dijon and later to Strasbourg as a teacher. In Strasbourg, possibly the most important thing he did was to marry Mademoiselle Laurent, the daughter of his chief. She proved a mainstay throughout his life, and well deserved the tribute of one of Pasteur's disciples: "She was not only an incomparable companion for her husband but also his best collaborator." He pursued his studies in crystallography and he pursued racemic acid. No one knew how to make it. He heard of people in Leipzig and Vienna who were supposed to be able to do so, and off he dashed. But in the end he had to make it himself, and this gained for him the ribbon of the Legion of Honour and a prize of 1,500 francs from the Pharmaceutical Society of Paris.

In another pretty piece of work which he did later he used a common blue mould, a penicillium. When this was grown on racemic acid it assimilated the right-handed portion leaving only left-handed tartaric acid. A remarkable example of the extraordinary power of selection of a living organism. People may say and did say: "What is the use of all this? Why such a fuss about a little dissymmetry of crystals?" You can answer like Franklin: "What is the use of a newborn child?" Pasteur's first scientific baby, born of tartaric acid, inspired later workers so that a complete new science of stereo-chemistry has arisen explaining structure and enabling synthesis of many organic compounds. In London this work did not pass

* A lecture delivered at the Science Museum on April 10 to inaugurate the Pasteur Exhibition, temporarily transferred to London from the Palais de la Découverte in Paris.

without notice, for it earned for him the Rumford Medal of the Royal Society—and that at 34 years of age.

In 1854 Fate ordained that Pasteur should be sent as Dean of the Faculty of Science to Lille. One of the industries of Lille was the production of alcohol by fermentation of beetroot. In those days the prevalent theory of fermentation was that of Liebig—that it was a purely chemical process in which yeast played no active part. Latour and Schwann had produced good evidence that yeast was a living organism, but Liebig and his supporters would not have it that a living yeast took any part in the fermentation process.

The father of one of Pasteur's students was worried by the irregularities of his fermentations and asked Pasteur to help him. This was the stimulus that set him off on his study of fermentations, which occupied him for many years and led him on to his later work on animal infections. He set to work with his microscope and found that in the unhealthy lactic fermentations the globules were elongated and quite unlike the rounded globules of yeast found in the healthy alcoholic fermentations. Some of the products of these fermentations were optically active. His previous work had convinced him that this optical activity was a property possessed by substances synthesized by living things, in contradistinction to substances synthesized chemically in the laboratory. He was therefore predisposed to consider these ferments as living organisms. In the fermentation of impure substances like grape juice and beer wort there were many complicating factors, so he prepared a culture fluid containing only a watery solution of sugar, mineral phosphate, and an ammonium salt. No organic nitrogenous matter was present. In this simple medium a minute implantation of yeast promptly fermented the sugar, thus confounding the upholders of the purely chemical theory of fermentation, who had maintained that without organic nitrogenous material such fermentation was impossible. Perhaps more important for us in this was the fact that Pasteur initiated the method of working with a simple culture medium in which the chemical changes could be more readily observed. This was an enormous advance and is the method still used by the bacteriological chemists. Thus even in his early work on lactic fermentation he was laying the foundations of bacterial culture.

It is quite impossible to go into details of this work here. It received much criticism, but Pasteur was a fighter as well as a wonderful experimenter and he was able to confound his critics. He had got to the stage when he wrote:

"I can bear witness to the existence of a large number of distinct yeasts setting up chemical transformations in accordance with their nature and constitution; but most frequently the nourishment suited to one allows others to develop. Hence arise most complicated phenomena, liable to constant variations. If one does succeed in separating one of these ferments and making it grow by itself, it produces the corresponding chemical change with remarkable precision and simplicity."

That is as true to-day as when he wrote it.

Having got so far with these fermentations, and having shown that they were due to living organisms, the next question was, Where did these ferments come from? Did they arise spontaneously or did they come from outside? The question of spontaneous generation had been discussed for centuries. Many and curious were the prescriptions for producing animals. Virgil's method for producing bees was:

"Kill an ox two years of age, whose young horns are just beginning to curl on his brow, place him in a narrow enclosure strewn with leaves of thyme and rosemary freshly gathered, and soon from his fermenting humours there rises a swarm which fills the air like rain from summer clouds."

Van Helmont had a recipe for producing rats:

"Cork up a pot containing corn with a dirty shirt; after about 21 days a ferment coming from the dirty shirt combines with the effluvium from the wheat, the grains of which are turned into rats, not minute and puny, but vigorous and full of activity."

This sounds almost as learned as some of the explanations of things which we hear to-day and possibly is as truthful.

In the 18th century Spallanzani had produced experimental evidence that spontaneous generation did not exist, but people were not convinced, and the controversy went on. In 1859 the academy offered a prize for "an endeavour by means of careful experiments to throw new light on the question of spontaneous generation." Pasteur's studies on fermentation fitted him for this new investigation. His seniors, Biot and Dumas, tried to dissuade him, but he went on.

We have not time to go into the multitude of experiments which Pasteur made on this subject or into his controversies with Pouchet or Bastian, but one simple experiment might be mentioned. The neck of a flask half filled with a fermentable fluid was drawn out in a swan's neck form. The fluid was boiled to sterilize it, and then the flask was allowed to stand at a temperature suitable for fermentation. No fermentation occurred, although it promptly appeared in a similar flask in which the neck had not been drawn out. The dust dropping from the air settled on the bend of the drawn-out flask and never reached the fluid, but if the flask was tilted so that some of the fluid reached this dusty bend and was then allowed to run back fermentation promptly started. This made him state: "The dust suspended in the air is the only origin and the first and essential condition of life in infusions." It was at this time also that he said: "It is very desirable to carry these researches sufficiently far to prepare the way for a serious inquiry into the origin of disease." That showed the trend of Pasteur's thoughts about the germ theory of disease.

The First Pasteurization

Pasteur's home was in Arbois—a wine-growing country. He was naturally interested in the production of good wines, and I can assure you from personal experience that Arbois produces good wine, for it was in November last on the occasion of the 50th anniversary of his death that we visited Arbois and indeed Pasteur's own vineyard there. The wine producers were in trouble. Many of the wines rapidly became unpalatable, sour, and ropy. Pasteur investigated this in much the same way as he had other fermentations. He examined with the microscope the bodies found in healthy wine fermentations: these were yeasts. In the spoilt wine he found other minute bodies, and he showed that it was by the fermentations set up by these that the wine acquired a nasty taste. Much more important from a practical point of view was his finding that these secondary fermentations could be prevented by slight heating of the wine. This did not interfere with its flavour but completely stopped the spoilage. This began the process which we know as pasteurization, to the great benefit of the wine industry of France. Pasteur explained also the essentials of the process of making vinegar. Whether made in the French way in casks or in the German way by slowly trickling wine over beechwood shavings it was the same—a minute organism, the *Mycoderma aceti*, provided the ferment, but it required plenty of air for its action. So the vinegar industry also benefited.

Pasteur's work now took a new turn when his friend and supporter, the famous chemist Dumas, who came from the silk country, implored him to go there and investigate a

disease which was destroying the silkworms and ruining the country. Pasteur pointed out that he knew nothing of silkworms or their diseases, but Dumas had the greatest faith in the genius of his younger colleague and managed to persuade him. I have not time to go into details of Pasteur's work on silkworms—how he collected information about their life history, how he examined them, healthy and diseased, under the microscope, how for a long time he was confused by the presence of two distinct diseases, or how he finally showed that it was possible to obtain and perpetuate healthy broods by selection of healthy stock and by cleanliness. In spite of the fact that in the middle of this work he was stricken with a form of paralysis from which he never recovered he was able in the space of five years to convince the silk growers that his methods were sound, and the silk industry of Europe was restored to prosperity.

After the Franco-Prussian war in 1871 Pasteur went on a holiday to his friend Duclaux at Clermont Ferrand: there was a large brewery near by. Pasteur, as always, was interested in the fermentations. Like the making of wine and vinegar, beer-making had been largely rule of thumb with little knowledge of what was happening, and the brewers found that often the beer would not keep. It got sour or even putrefied. Pasteur with his indispensable microscope examined deposits from good beer and bad beer and noted the differences. Then he wanted to extend his observations to the larger English breweries, and in the same year he came to London and paid his historic visit to Whitbread's. In Vallery Radot's life of Pasteur it tells how he was well and courteously received, but instead of just seeing round the brewery he wished to see some of the barm of the beer. After examining it with the microscope he suggested that it was not too good. This made them sit up and take notice, for they already knew all was not well. Then he examined other batches, and could say from his simple microscopical examinations whether they were good, bad, or indifferent. He made such an impression that when he returned a week after Whitbread's had purchased a microscope and were beginning to control their fermentations. This microscope is becoming well known from the advertisement at present in the London tube stations, and is actually in this Pasteur exhibition in the Science Museum. This immediate acceptance of new ideas and controls was certainly to the credit of Whitbread's.

Just as with wine, Pasteur found that the souring of beer was due to a secondary fermentation with contaminating microbes. The pure brewers' yeast produced the essential fermentation which made good beer, but if the vessels were contaminated with the souring microbes these grew out later and spoilt the beer. Again, just as with wine, Pasteur found that heating the beer for a short time to 55° to 60° killed these contaminations. This was the origin of pasteurized beer.

It was in 1873 that Pasteur entered new fields by being elected (by one vote only) to the Academy of Medicine. Little did the academicians know when they admitted this chemist of 53 years of age that in another ten years he would have revolutionized many of their ideas.

In his studies on fermentation he had always in his mind that many human ailments were due to microscopic living objects (the word microbe was only introduced a few years later), and human infection had been forcibly brought home to him by the death of two daughters from typhoid fever. By this time Lister had, as a direct result of Pasteur's publications, introduced antiseptic surgery and was creating a revolution in that art. Other workers were contributing to our knowledge of what we may now call microbes, and the "germ theory" was being promulgated.

Davaigne had demonstrated what he called the bacteridium of anthrax. Koch had grown it outside the body and demonstrated its character and mode of growth. It was only in 1877 that Pasteur, in collaboration with Joubert, commenced his work on anthrax. He cultivated a drop of anthrax blood through many flasks of culture medium so that anything dead in the original blood was diluted to extinction. After nine passages it was calculated that the original drop of blood had been diluted in a volume of fluid equal to the volume of the earth, and Pasteur did not stop at nine passages—he did many times nine. The last of these cultures was just as infective for rabbits and guinea-pigs as was the first one. He could then state positively that the bacteridium was the real infecting agent.

Other diseases were being connected up with definite microbes, and one of these, chicken cholera, had an enormous effect on subsequent developments in medical and veterinary practice. Pasteur isolated a microbe from fowls suffering from this disease, and he and his associates had shown that healthy fowls inoculated with cultures of this microbe contracted the disease and died. But on one occasion old cultures were used for these inoculations instead of fresh ones. The fowls did not die. The microbes in the cultures were alive, but for some reason they did not kill the chickens. They made new cultures and again inoculated the fowls—some of the survivors of the last experiment and some fresh ones; the previous survivors again survived, but the fresh ones got the usual chicken cholera and died.

Attenuation and Immunization

A less observant man might have passed this by, but not Louis Pasteur. He recognized that he had by the injection of the old culture immunized the fowls against the disease. Here was a new method of preventing infection. Cultures had first to be attenuated—that is, altered in some way that they do not kill the animals. Then when injected into the animals they give the animal protection, not death. Then Pasteur applied these methods to anthrax, a disease which was killing thousands of cattle and sheep. He had to find out how to attenuate his cultures so that they would not kill the animals. This he did by growing them at a higher temperature than normal. With vaccines made from microbes grown at these higher temperatures he found he could protect animals. But there was disbelief, as there always is with something startling or unusual. How could a chemist without veterinary or medical qualifications discover these things? He was challenged to one experiment to prove his statements and he readily accepted.

On a farm, Pouilly le Fort, 25 sheep and 6 cattle were inoculated with Pasteur's vaccine and the same number were left untouched. Two weeks after the second vaccine injection all were injected with a virulent culture that was known to cause the disease. Two days after, on June 2, 1881, there was an enormous concourse of people to see the results—senators, scientists, newspaper men, and others. The result was a phenomenal success: all the uninoculated animals were dead or dying while all those inoculated with Pasteur's vaccine were alive and well. I cannot do better than tell you the result in Pasteur's own words from a letter to his children written on the morning of June 2, 1881, before he left Paris to see it himself. "The telegram tells me that when we arrive at 2 o'clock this afternoon all the non-vaccinated subjects will be dead. 18 were already dead this morning and the others dying. As to the vaccinated ones they are all well." For Pasteur 1881 was a memorable year; so it was for me, for it was then I was born.

Chicken cholera and anthrax have been defeated. Swine erysipelas was successfully tackled, and then the cry in

regard to all infections was, "Find the microbe and make a vaccine." And for Pasteur a vaccine was synonymous with an attenuated living culture. At that time rabies or hydrophobia was much more prevalent than it is to-day, and it was a dreaded and fatal disease. It was known that it followed the bite of a rabid dog, but beyond that there was complete ignorance. (We in Britain know little of hydrophobia. The quarantine precautions on dogs wiped it out, and we shall be free so long as there are no foolish persons who from mistaken sentimentality deliberately defeat this quarantine.) Pasteur set to work on rabies. He injected saliva from a child suffering from the disease into rabbits. They died, and some of their blood injected into other rabbits was likewise fatal. In the blood of these rabbits microbes were seen, but Pasteur was not deluded as were some others into the belief that he had discovered the microbe of rabies. He found he could get the same result with saliva of children suffering from other diseases or even with saliva from healthy people. Actually he had discovered the pneumococcus—the microbe usually responsible for pneumonia. The actual microbe of rabies eluded him. He could not see it with his microscope. That is not surprising, for we now know that it belongs to the class of viruses which are so small that the ordinary high-power microscope does not reveal them. But he was not beaten. The nervous system of dogs was obviously affected, so he went to the nervous system for his material. He injected material from the brain of a rabid dog into healthy ones and reproduced the disease after the usual incubation period. Then his assistant Roux injected similar material into the brain of a dog, and it became rabid in only fourteen days. The infective agent was concentrated in the central nervous system.

There is not time to go through the hundreds of experiments which Pasteur and his collaborators made, but they found that brain tissue from a rabid dog injected into a rabbit, and then from rabbit to rabbit, became more and more virulent until it reached a certain state when it remained constant. The spinal cords of the rabbits infected with this "fixed virus" were taken out and dried for various times. The longer they were dried the less virulent they became. The dogs were immunized by injection of an emulsion of a piece of the rabid spinal cord which had been dried for 13 days. Next day a piece which had been dried for 11 days was injected, and so on till the dog received the fresh virulent spinal cord. They did not get rabies, and subsequent attempts to give them rabies failed. They were injected with infective material from mad dogs. They were bitten by mad dogs, and they remained well. They had been successfully immunized.

One problem had been solved. Dogs could be immunized against rabies. But what to do? It was an impossible task to immunize the millions of dogs in France. But was it possible to immunize a human being in the same way during the incubation period—that is, between the time he was bitten and the time the symptoms appeared? The incubation period was long—several weeks—so possibly there was time; but the question was not yet solved as to whether the injection of the dried rabbit's spinal cord which did not infect the dog would be equally harmless to man. At last Pasteur's hand was forced. From Alsace came Mme. Meister, bringing her boy Joseph, who had been severely bitten by a mad dog, and imploring Pasteur to save him from the dreaded disease. Pasteur immunized Joseph Meister as he had done his experimental dogs. The injections were harmless, and Joseph Meister did not get rabies. At last it had been shown that it was possible to protect man against infective disease even after the infection had occurred. The immunization of Joseph Meister was not a flash in the pan. It was successfully repeated on many others, and Pasteur's laboratory in Paris became the mecca of people from all over Europe who had been bitten by rabid dogs.

This may be regarded as the culmination of Pasteur's great work. Famous he had been before; but now he was a national hero. Subscriptions were invited for the foundation of an institute in which he could carry on his great work, and they poured in from all over the world. The Pasteur Institute was erected in the Rue Dutot (now renamed the Rue de Docteur Roux after Pasteur's great collaborator). On Nov. 14, 1888, the new institute was opened by President Carnot. A quotation from Pasteur's speech on that occasion summarized his philosophy:

"To believe that one has made an important scientific discovery; to be in a fever to announce it and to restrain oneself; to force oneself to confute one's own experiment, and only to proclaim a discovery when all contradictory hypotheses have been disproved—yes, this is an arduous task. But when after very many attempts one has at last arrived at certainty, one experiences one of the greatest joys the human mind can feel, and the thought that one will add to one's country's glory makes this joy greater still."

Another quotation from the speech:

"I would say that two contrary laws seem to be wrestling with each other nowadays: the one a law of blood and death, ever imagining new means of destruction and forcing nations to be constantly ready for the battlefield—the other a law of peace, work, and health, ever evolving new means of delivering man from the scourges which beset him. Which of these two laws will ultimately prevail God alone knows."

How true to-day!

In 1892, on the occasion of his 70th birthday, an enormous crowd gathered in the theatre of the Sorbonne. Our Royal Society was represented by Lord Lister, who said: "Truly there does not exist in the whole world an individual to whom medical science owes more than to you." That was said 53 years ago. It is true to-day except that Pasteur is now with us only in spirit.

In the new institute Pasteur was able to see his assistants and collaborators carry on his great work. His health failed, and on Sept. 28, 1895, he died in peace. His body lies in the Pasteur Institute, the useful monument erected for him in his lifetime: his spirit animates workers in microbiology throughout the world.

In succeeding years Pasteur institutes were opened in many parts of the world to carry out Pasteur's methods, and, quite apart from the immediate benefits which this gave in the preparation of vaccines and the protection of man and animals, they have advanced knowledge in many ways, as can be seen from a study of the exhibits in this beautifully arranged Pasteur exhibition.

The introduction to the catalogue of this exhibition is written by Pasteur's illustrious grandson, Prof. Pasteur Vallery Radot, who is not only a great physician but a great partisan. In this he points out how throughout his scientific life Pasteur was encouraged and assisted by British scientists—Tyndall, Lister, and others. He tells of his emotion at witnessing the embrace of Pasteur and Lister on the occasion of his jubilee with these words: "Was not this gesture a symbol of the bonds uniting our two nations?"

It is good to see the line of the great Pasteur so worthily carried on.

We have surveyed Pasteur's work. Let us see briefly how it has affected us in our lives to-day. People have often speculated on which of Pasteur's many discoveries was the most important. It is very difficult to say. The

chemist may say it is his early work on crystals; the pure microbiologist, that it is his refutation of spontaneous generation; the industrialist, that it is his work on fermentation of wine and beer; the agriculturist, that it is his study of silkworm disease or the protection of animals against anthrax and other diseases.

A physician will be doubtful, for almost all of them have assisted him in his work. As a microbiologist and a physician I have the greatest admiration for his last great work on rabies. It was difficult; he had so little to go on; it was so methodically tackled; and it was so successful. His work on fermentations led directly to the cure of diseases of wine and beer. There are teetotallers who may think this is a misfortune, but especially in these disturbed times such beverages seem to provide solace. But his work did more than that. The abnormal fermentations of wine and beer were cured by a process which became known as "pasteurization." We hear of pasteurization now, but it is the pasteurization of milk we hear of. It is by this process of pasteurization that much milk-borne disease is prevented in our large cities; and this we owe to Pasteur's studies on alcoholic liquors.

The Antiseptic System

There was another and even more important direct outcome of Pasteur's fermentation work. Lister, who was then working in Glasgow, read Pasteur's communications, and in them he saw the possibility of keeping germs out of the operation room. In those days nearly all operation wounds were septic and many gangrenous. We have had handed down to us the phrase "laudable pus." Then it was a sign that the patient would probably recover. Now of course pus of any kind, "laudable" or otherwise, is a reflection on the surgeon's methods.

There had been many explanations offered as to the origin of this putrefaction of wounds, but it was Pasteur's work which made Lister see the true light. The infection came from outside, so Lister sterilized as far as he could with carbolic acid and other antiseptics his hands, his instruments, and his dressings. He even used a carbolic spray to sterilize the air. Thus he revolutionized surgery and became one of the greatest figures in British medical science. It was in 1874 that Pasteur received a letter from him saying: "Allow me to take this opportunity of thanking you most heartily for having shown me, by your brilliant investigations, the truth of the germ theory of putrefaction, and for having thus acquainted me with one principle which can lead the antiseptic system to final success." How much life and suffering has been saved by the methods which Lister and his successors initiated as the result of Pasteur's teaching!

In his studies on spontaneous generation and on bacteria he and his colleagues introduced methods which we all use to-day. Notable among these was the introduction of the autoclave for sterilizing material by steam under pressure. This is in constant use to-day in hospitals, in laboratories, and in industry.

Let us now come to the later and most directly medical work—the protection of animals and man against infection. The experiment on anthrax at Pouilly le Fort in 1881 proved without a shadow of doubt that animals could be protected with vaccines. That was settled once and for all, but we still argue about the details of vaccine therapy; and even now there are hundreds of laboratory workers engaged in exploring the uses of various vaccines and the best way of producing them.

All Pasteur's vaccines were living attenuated cultures, and it was only in the case of rabies that they were used on man. Living vaccines have drawbacks. Although they can be attenuated so that they do not cause disease, this requires care and skill, and, human nature being what it is, sometimes one is a little careless, and instead of the living vaccine protecting it might actually give rise to the infection. As "superior" human beings we might occasionally allow that with cattle, pigs, or sheep, but no one would willingly look with complaisance on the possibility of one's child succumbing to the injection of a protective vaccine. But after Pasteur's time it was found that even if the microbe in a vaccine were killed protection against many diseases could be obtained. The great advocate of immunization with killed cultures was our countryman and my own master, Sir Almroth Wright. At the end of the last century he showed that typhoid fever could be prevented by inoculation with a killed typhoid vaccine. This was a safe procedure. The microbes in the vaccine were dead and could not infect. Now the use of typhoid vaccine is world-wide, and this great scourge of armies in the field has been reduced to comparatively negligible proportions. This is not all due to typhoid vaccine. Hygiene has an important place; but so has the vaccine. In many other bacterial diseases, also, killed bacterial vaccines have been and are being used extensively. The use of these dead vaccines was further extended by Wright to the cure of infections which had already established themselves, and large numbers of these infections have been so treated.

Rabies was in a rather different category. That was a virus disease. Pasteur could not find the microbes, so his vaccine was an emulsion of infected tissue containing a large amount of the virus. This same procedure is used to-day in virus diseases such as dog distemper, yellow fever, and influenza. Instead of the dried rabbit's spinal cord which Pasteur used, the vaccine may be made from a mouse's lung or from material obtained from a chick embryo infected inside the eggshell. Some of these virus vaccines confer a solid immunity, and as we become more and more acquainted with the viruses we shall be able to produce more and more potent vaccines. By means of the electron microscope we can now see the viruses. By various methods we can measure them, and we are gradually learning more and more about them; but the general principle of the virus vaccine to-day is much the same as that of Pasteur's original rabies vaccine.

Antitoxins and Antibiotics

This process of immunization has proceeded beyond vaccines. In Pasteur's lifetime his colleagues, Roux and Yersin, discovered a powerful toxin made by the diphtheria bacillus. Animals immunized with this toxin produced antitoxin, and every child suffering from diphtheria is now treated with this antitoxin. Much more recently it was found that this poisonous toxin could be treated with formalin, when it ceased to be poisonous but still evoked in animals the production of antitoxin. The name of Ramon of the Pasteur Institute is associated with the immunization of children by injection of this anatoxine, as he called it, or toxoid as we call it here. Many people have improved the method; it is harmless; and it certainly gives a good protection against diphtheria. It is a very serious responsibility for a parent at the present day to refuse to have his or her child immunized against this serious infection. The same method is used for protecting against tetanus or lockjaw, and it was Ramon who showed its merits in the immunization of man. In the recent war all our armies were immunized and there was almost no tetanus. Thus another scourge of war was eliminated.

Then there is another method of dealing with bacterial infection in which I am myself particularly interested. I mean penicillin. Penicillin belongs to the class of sub-

stances called antibiotics. These are substances produced by living bodies which have the special property of killing or interfering with the growth of micro-organisms. It was Pasteur and his colleague Joubert who in 1877 first described this phenomenon of bacterial antagonism. Pasteur did not pursue this subject; he had other more obviously important matters in hand. If he had gone on with it, who knows but that we might have had penicillin in the last century or perhaps even before I was born.

I have said nothing about the laboratory accommodation which was provided for Pasteur during his life. At the end perhaps it was adequate, but in the earlier years when he made his great studies on fermentation it was lamentable. Nowadays it would be considered disgraceful that any scientist, much less a scientist already famous, should be so badly housed. An American newspaperman described my own laboratory as like the backroom of an old-fashioned drug store, and yet my laboratory is adequate and reasonably modern. What would they have said about Pasteur's attic? It only shows that it is not the grandeur of the laboratory but the grandeur of the man that matters, and that the marble halls so common in certain parts of the world are quite secondary to the brain of the worker.

We have seen something of Pasteur's scientific accomplishments. We have seen something of what they have led to, and something of the debt which the world owes to his genius and perseverance. Not even a partial paralysis could daunt him, and much of his best work was done after that illness. Pasteur was the founder of a science, "microbiology." He was a chemist who gradually became a biologist. His successors were mainly biologists, but in recent years microbiological science is becoming more and more chemical. In the short space of 70 years it is completing a circle from chemistry through biology to chemistry again. But Pasteur was not only a scientist. He was an artist of considerable merit and he was a very human man, adoring his family and his home and his country. His father, his wife, his children, and his grandchildren were very dear to him, and it is a great pity that his grandson, Professor Pasteur Vallery Radot, could not be with us in London to-day.

There have been admirers who claimed for Pasteur more than he had done. That is unnecessary and does not help his memory. He did in his lifetime sufficient to make ten men great. That is enough. It is a pity to gild the lily. He was one of those rare individuals thrown up at intervals throughout the world's history to restore order out of chaos. He was a great Frenchman, but it is not only France which has to thank him. The whole world is deeply in his debt, and we here in London take this opportunity of rendering homage to the memory of our great benefactor, Louis Pasteur.

Negotiations have been completed for close co-operation between the Prince of Wales's General Hospital, London, N., the largest voluntary general hospital in North-East London, with 260 beds, including its convalescent home at Nazeing, Essex, and the Bearsted Memorial Hospital, London, N., which is a voluntary maternity hospital. The first stage of this hospital's new building at Stoke Newington is now rapidly nearing completion and will be opened in July. The new building when completed will have a total of 100 maternity beds and will be the most modern maternity unit in Britain. It is proposed that in addition to general medical and surgical service, already supplied by the Prince of Wales's General Hospital, these two hospitals will eventually provide a complete obstetric and gynaecological service for the district. With this association the following hospitals will now participate in the North London Postgraduate Medical Institute, which provides senior postgraduate teaching under the aegis of the British Postgraduate Medical Federation of the University of London: Prince of Wales's General Hospital; North Middlesex County Hospital; Chase Farm Hospital; North-Eastern Fever Hospital; Bearsted Memorial Hospital.

EFFECTS OF CERTAIN DIETS ON THE LOSS OF NITROGEN IN URINE AFTER EXPERIMENTAL BURNS

BY

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After burns or other injuries the urinary excretion of nitrogen may be definitely increased. Cuthbertson (1930, 1936), Peters and his associates (Leach *et al.*, 1943; Clark *et al.*, 1945), and others have observed that the extent and depth of burning affect the amount and type of nitrogenous material excreted. Investigations by Taylor and his associates (1943), Co Tui *et al.* (1944), and Elman, Charnas, and Davey (1943) have shown that large amounts of protein must be administered after extensive burns if nitrogen equilibrium is to be maintained. Croft and Peters (1945) reported that the increase in nitrogen loss after burning could be reduced substantially by giving methionine, or a protein supplement, to rats maintained on a moderate or low-protein diet. In their studies, rats of either sex, weighing from 100 to 150 g., were placed on a basal diet containing 10% casein and 10% dry yeast until a satisfactory nitrogen balance was obtained. Under ether anaesthesia a standard burn covering approximately one-third of the body surface was produced in water at 73° C., and the effects of various supplements added to the diet were then studied. In control groups of animals an increased nitrogen excretion in the urine occurred. In groups receiving a supplement of 1% methionine or 18% casein little increase was noted, while groups receiving supplements of alanine, cysteine, or an amino-acid mixture including only a little methionine showed no significant difference in nitrogen excretion from the controls. This observation that one amino-acid can replace the extra protein supplement "supports directly the hypothesis that the nitrogen loss is due to the raiding of tissue protein molecules for methionine." The finding that neither alanine (as a source of amino groups) nor cysteine (as a source of sulphur) had the same effect suggested to Croft and Peters that the other well-known function of methionine—that of methylation—was responsible for the effect observed.

Experiments have been performed in this laboratory on rats maintained on both normal and deficient diets. The results confirm only in part, and extend and modify, the conclusions of Croft and Peters. Prof. Peters has kindly examined some of the results of our experiments, and his comments have been most helpful.

Experimental

1. *First Methionine Series.*—Young female rats of a Wistar strain, weighing between 100 and 150 g., were placed on a diet of 15 g. of fox chow a day until a moderately constant urinary output of nitrogen was secured. This usually occurred in from 10 to 14 days. Under ether anaesthesia they were then subjected for a period of 30 seconds to water at 73° C., in a manner similar to that described by Croft and Peters. Most of the animal's back, amounting to about one-third of the surface area of the body, was immersed in heated water. On the day of the burn and daily thereafter a buffered solution of methionine equal to 1% of the diet was injected subcutaneously into six of the nine rats used in the experiment. The animals were weighed daily and urinary nitrogen estimations were made at 48-hour intervals for ten days after the burning.

Finely ground food was placed in small dishes outside the individual cages in such a manner that the rat could not enter the dish or readily scatter the food. After the first day or two in the cages little or no scattering occurred. The circular bottoms of the cages were of stainless fine-mesh wire screening. Urine dropped through upon waxed funnels and ran into test-tubes containing concentrated sulphuric acid. Macro-Kjeldahl nitrogen estimations in duplicate were done on a 5-ml. aliquot of the sample after it had been made up to a standard volume. A pledget of fibre glass was placed in the funnel as an additional safeguard against faecal or food contamination. The weight range of the rats was fairly narrow, and grouping was carried out by using a table of random numbers. All animals received the same amount of food; the control and test groups consumed approximately the same amount.

2. *Second Methionine Series.*—The first experiment was repeated, using 20 female rats ranging from 140 to 160 g. in weight. Since in the first experiment no significant rise in nitrogen excretion took place after burning, a temperature of 85° C. was selected instead of 73° C. Twelve animals were given a supplement of methionine amounting to 1% in the 15 g. of ground stock diet fed daily. In other respects the procedure was similar to the previous study.

3. *Third Methionine Series.*—Twenty-one adult female rats, 170 to 205 g., were divided into three groups of seven. They were fed a low-protein (12%) diet (Table I, Diet 1) *ad libitum* for seven days, and then given the amount of their average daily consumption for a further seven days before burning. One group received the basal diet throughout. Another group received the basal diet plus a supplement of methionine (1% of diet) throughout. The third group received the basal diet until the day of the burn, and were then given a diet supplemented with methionine. Burning was carried out as before, in water heated to 85° C. In this experiment, however, nitrogen estimations were performed on the collected urine from each group rather than from individual rats. Therefore only a "group" figure is available.

4. *Fourth Methionine Series.*—Twenty-three young female rats weighing from 70 to 90 g. were fed 8 g. a day of a diet deficient in methionine (Table I, Diet 2). The procedure followed in experiments 2 and 3 was continued, with the exception that the temperature was decreased to 75° C. In a preliminary experiment with this diet, burning at the higher temperature had resulted in a high mortality. After the burn, collections were made at three instead of five 48-hour intervals. Eleven rats received a methionine supplement and twelve acted as controls.

TABLE I.—*Diets in Burn Experiments*

Diet 1	%
Casein	10
Fibrin	2
Beef dripping	6
Corn oil	2
Salts	2
Vitamin supplement	1
Sucrose	77
Choline chloride	0·1
Cod-liver oil conc.	0·015

Diet 2	%
Casein	10
Fibrin	2
Arachin	2
Celluflour	2
Salts	5
Vitamin supplement	1
Beef dripping	10
Corn oil	2
Sucrose	65·3
Cod-liver oil conc.	0·15
Choline chloride	0·3
Phenylalanine	0·3

Diet 3	%
Casein	8
Fibrin	7
Zein	2
Celluflour	2
Salts	5
Vitamin supplement	1
Beef dripping	10
Corn oil	2
Sucrose	62·3
Choline chloride	0·34
Methionine	0·119
Histidine	0·132
Cod-liver oil conc.	0·015
Vitamin Supplement (per 10 g. diet)	
Thiamine	50
Riboflavine	25
Pyridoxine	20
Calc. pantothenate	100
Niacin	100
Vitamin A	at least 300 i.u.
Vitamin D	at least 75 i.u.

5. *Fifth Methionine Series.*—Twelve adult female rats, 180 to 200 g., were fed 12 g. a day of the same diet as in the fourth series. The procedure was similar to that described in the previous series.

6. *Cystine Series.*—Young rats, 70 to 90 g., were fed 8 g. a day of the same basal diet as in the fourth and fifth methionine series. The experimental animals received a supplement of cystine equivalent in sulphur content to the methionine supplement formerly given (810 mg. per 100 g. cystine). Choline chloride in an amount of 0.34 g. % was present in the diet. The procedure followed was similar to that described above. Ten rats received the cystine supplement, while eight acted as controls and received the basal diet only.

7. *Lysine Series.*—A final experiment was performed in which young female rats weighing from 70 to 96 g. received a diet (Table I, Diet 3) designed to be deficient in lysine. This diet, however, contained 17% protein, in contrast to the previous basal diet, which contained only 14% protein. The experimental procedure and dietary intake (8 g. a day) remained the same.

Results

In the first experiment, in which burning was carried out at 73° C., there was no appreciable increase in urinary excretion after the burn, either in the control or in the experimental group.

In experiment 2, in which a temperature of 85° C. was used to produce the burn, a significant increase in the average daily urinary nitrogen excretion occurred after burning. There was no significant difference between the methionine-treated group and the control group—P=0.7 approx. (Table III). After burning, an immediate increase in body weight occurred in both experiments.

TABLE II.—*Amino-acid Composition of Diets (mg. per 100 g. diet)*

Amino-acid	Diet No. 1	Diet No. 2	Diet No. 3	Estimated Requirement (Rose, 1937)
Methionine	348	371	457	600
Threonine	548	620	637	600
Valine	708	768	739	700
Leucine	1,216	1,256	2,826	900
Isoleucine	710	880	871	500
Arginine	550	752	527	200
Histidine	290	342	297	400
Lysine	930	1,060	733	1,000
Phenylalanine	660	610	1,011	700
Tryptophan	220	203	162	200
Cystine	88	101·3	137	

After burning, rats in the experimental group were fed Diet No. 1, supplemented with 1% methionine.

In Diet No. 2, *dl*-phenylalanine—300 mg. per 100 g. diet—was added, raising the intake of this amino-acid to 910 mg. per 100 g. diet. After burning, 1% methionine was added to the diet of the experimental group. In the experiment involving cystine, an amount equivalent in sulphur content to 1% methionine—namely, 810 mg. per 100 g.—was added in place of the methionine.

In Diet No. 3, levels of methionine and histidine were raised by adding 119 mg. methionine and 107 mg. histidine per 100 g. of diet. After burning, lysine, 367 mg. per 100 g. diet, in the form of 458 mg. of lysine hydrochloride, was added to the diet of the experimental group.

TABLE III.—*Mean Increase in Daily Nitrogen Excretion (in mg. of N)*

Series	Control	Treated	P Value*
Methionine 2	63·1 ± 9·1 (8)	56·8 ± 11·0 (12)	0·7
„ 4	45·7 ± 3·7 (12)	31·6 ± 4·7 (11)	0·02
„ 5	37·4 ± 12·5 (6)	13·0 ± 8·7 (6)	0·15
Cystine	25·0 ± 2·1 (8)	28·2 ± 5·6 (10)	0·63
Lysine	50·2 ± 3·4 (6)	52·8 ± 4·6 (5)	0·69

Bracketed figures indicate number of animals.

* Fisher, R. A., *Statistical Methods for Research Workers.* Edition 8. Oliver and Boyd, 1941.

In series 3, as figures are available only on the excretion of nitrogen by groups of animals, it is not possible to analyse the results satisfactorily. Nevertheless, the figures give no indication that on this diet the supplementary methionine decreased the loss of nitrogen. Table II shows that the diet was deficient in several amino-acids besides methionine.

In series 4, with *a specific deficiency of methionine in the basal diet given to young rats,* there was a significant

difference (P=0.02) in the increase of nitrogen excretion after burning between the methionine-treated group and the control group. The group which received a supplement of methionine (1%) in the diet showed less increase in nitrogen excretion than the control group (Table III).

In adult rats receiving the same methionine-deficient diet (series 5) no significant difference in nitrogen excretion was noted—P=0.15, approx. (Table III).

A comparison of the increase of nitrogen excretion in the control and experimental groups of the cystine series (No. 6) shows no significant difference (P=0.63). Although the sulphur deficiency of the diet was made up by a cystine supplement equivalent to methionine 1%, and an adequate amount of choline was present in the diet, the effect of methionine noted in series 4 did not occur (Table III).

In the final experiment, when the lysine deficiency in the diet was made up, the increase in nitrogen excretion after burning remained of the same order as that of the control group. When compared statistically a P value of 0.69 was obtained (Table III).

Discussion

Cuthbertson (1936) found that administration of diets rich in certain proteins and of a high calorie value decreased the loss of nitrogen after injury. Croft and Peters (1945) reported that administration of the single amino-acid methionine was capable of replacing good-quality protein in reducing the nitrogen loss. The present experiments confirm this action of methionine, but suggest strongly that it occurs only when a deficiency of methionine exists in the diet. In the preliminary group of experiments, when rats were fed the laboratory stock diet (20% protein) and burned at 73° C., little increase in nitrogen excretion took place, but at 85° C. a significant increase did occur. On a low-protein diet burning at 75° C. produced a definite increase in nitrogen loss both in control and in treated groups, but on this diet, using 85° C., a high mortality was encountered. When methionine (1%) was added to the chow diet in the first experiment no significance could be attached to the difference in nitrogen excretion between experimental and control groups.

When a methionine-deficient diet was fed to young rats (in which the methionine requirement is probably higher than in adult animals) and a methionine supplement (1%) was added after burning, the groups fed the supplement excreted less nitrogen than did the untreated group. With fully grown animals no such difference existed, though the P value (0.15) might be considered suggestive in view of other experiments.

From these results and a study of the diet used by Croft and Peters, it is suggested that their basal diet (14% protein) was probably deficient in several amino-acids, and particularly in methionine.

In the case of the cystine-supplemented diet no significant difference in nitrogen excretion from the control group could be demonstrated. An amount of sulphur equivalent to the methionine supplement was present and adequate choline (as a source of methyl groups) had been included. The suggestion that the activity of methionine is associated with its methylating function is not supported by this result. The addition of lysine to a lysine-deficient diet likewise failed to influence the nitrogen excretion.

It is difficult to draw general conclusions from nutritional experiments of this type. The nutritional demands under abnormal conditions such as existed in these experiments are not well known. It is not clear whether it is the general level of protein intake, or the ingestion of specific combinations of essential amino-acids or of certain individual acids, which is most directly concerned in preventing tissue breakdown or in hastening repair after trauma. The demands for growth and other body functions and the presence of other essential food factors no doubt affect these requirements. It does seem safe to assume that if a relative deficiency of methionine exists, whether due to a dietary deficiency or to metabolic requirements, its replacement may reduce the amount of nitrogen lost after burning, under certain specific conditions. The experimental evidence thus far produced suggests that this action is a specific effect of methionine, and cannot be produced by the administration of cystine plus choline.

In both dietary and toxic types of liver injury supplements of methionine or choline confer a degree of protection to animals fed basal diets low in protein (Miller and Whipple, 1942; Daft *et al.*, 1942; Messinger and Hawkins, 1940). Drill and Loomis (1946) have reported that no protection against liver damage due to carbon tetrachloride is given when methionine is added to a normal diet. However, in experiments involving the use of the lipotropic agents in experimental cirrhosis, one of us (E. A. S.) has produced evidence that a methionine deficiency may exist in relatively high (35%) mixed-protein diets. In this case a supplement of choline or methionine produced a dramatically favourable effect.

The experimental basis for the use of methionine in the treatment of burns would seem to limit its use to cases in which an absolute or relative deficiency of this amino-acid exists.

Summary

A methionine supplement (1%) to a stock diet did not reduce the urinary loss of nitrogen after burning.

When a methionine deficiency existed in the basal diet of young rats, however, a supplement of methionine lowered the nitrogen excretion.

When similar diets were given to adult rats a suggestive but not statistically significant decrease in nitrogen excretion followed the administration of methionine.

Cystine (in an amount equivalent in sulphur content to the methionine supplement) plus an adequate choline intake was ineffective in reducing the nitrogen loss in young rats.

A lysine supplement added to a lysine-deficient diet was also ineffective.

The experimental basis for the use of methionine in the treatment of burns would therefore appear at present to be limited to the application of the finding that methionine is effective in young animals receiving a diet very low in this amino-acid. With a more drastic dietary deficiency in methionine, or a more extensive injury, the beneficial effect of giving this amino-acid to adult animals might be revealed.

We appreciate the help of Prof. C. C. Lucas of this department in planning the diets and experimental procedures.

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RATIONS AND NUTRITIONAL NEEDS

BY

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AND

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Before the introduction of bread rationing the amounts of nutrients present in rationed foods* gave an inadequate picture of the sufficiency of the diet available to individuals or groups because of the large contribution made by bread to the nutritive value. The main contribution of bread is in respect of calories, protein, and the B vitamins, and its inclusion among the rationed foods was a step of fundamental importance. The rationing of bread reduced considerably the flexibility of the national diet; for it was formerly the main elastic reserve whereby those with large appetites could readily satisfy their needs. With the introduction of bread rationing it became inevitable to provide an increased supply for those with large energy requirements. Energy needs depend not only on obvious factors, such as body size and intensity of work, which are physiologically predictable, but also on unpredictables inherent in the personality or constitution of the individual. Because of the multiplicity of factors, particularly the unpredictables, that determine the needs for energy, it is beyond the wit of man to devise a workable scale of energy allowances strictly applicable to each individual in a mixed community. The rationing scheme is necessarily based on the average requirements of sections of the population. These averages embrace a wide range of variations which cannot be fully and accurately provided for in a national scheme. It is therefore inevitable that the rations should vary in accordance with individual requirements from relative excess on the one hand to relative deficiency on the other.

The purpose of this paper is to compare the amounts of nutrients, particularly calories, in the rations with the theoretical needs of differents sections of the population, to ascertain the gaps between these two, and to examine the means whereby the gaps can be bridged.

One of the fundamental principles in the scheme of rationing is that it should provide the bulk of the essential nutrients required by mothers, children, and invalids (priority classes). Many of the foods of special value for these classes, such as milk and eggs, are also good sources of energy. Consequently, their rations yield a larger proportion of their energy needs than is the case with other classes, so that the gap between the energy content of the rations and theoretical needs is smaller. Notwithstanding the rationing of bread there still exists considerable flexibility in the rationing system, and this derives from one or more of the following: (*a*) unrationed foods; (*b*) canteen, school, or similar extra meals; (*c*) the use of "points" to the best advantage, including exchange of points into bread units (B.U.s); and (*d*) diversion of rations from family members with small needs to others with greater needs (the family pool).

(*a*) *Unrationed Foods.*—The chief of these is potatoes, but they are relatively bulky; 16 oz. (454 g.), which is probably as much as the ordinary consumer ever eats, yields only 260 calories. Fruit and vegetables are relatively poor sources of energy, 8 oz. (227 g.), which is a fairly generous daily amount, yields on the average only about 50 calories. There remain fish, offal, sausages, and a few other foods of less importance, the procurement of which depends upon a complexity of factors; together they would probably yield not more than about 150 calories a day in normal circumstances.

(*b*) *Canteen and Other Meals.*—Those who have access to public eating-places could get almost any proportion of their requirements from this source, but permanent residents in hotels must surrender their ration books. School meals are planned to provide a maximum of 1,000 calories daily. Canteen meals and snacks could provide up to 1,000 calories or more daily.

(*c*) *Exchange of Points to B.U.s.*—The food value obtainable from a given number of points is variable, but, generally speaking, better nutritional value can be obtained from spending points on simple things, such as dried pulses and sardines, than on luxury foods, such as expensive canned fruits and biscuits. Exchange of all points to B.U.s would produce an average gain of some 350 calories, or about 50 per exchanged point a day.

(*d*) *The Family Pool.*—As pointed out below, the rations of young children provide in themselves more than enough calories for their needs. In addition, the energy needs of women and of old men are about 80%, or less, of those of the ordinary male, but the rations for all these are identical. It therefore follows that a family comprising one or more such people would have some spare rations to pass on to those with bigger appetites. For instance, about 100 calories a day would be provided by one ration of bacon and cheese, plus 1 oz. (28 g.) of fat weekly. These spare rations would, in addition, provide a "lubricant" for the greater consumption of unrationed foods such as potatoes.

Rations and Requirements Compared

Table I sets out the rations and allowances for different sections of the population, and Table II shows the amounts of nutrients derivable from the rations and compares these amounts (less deductions for losses of vitamins B_1 and C due to cooking) with the requirements suggested by the Technical Commission of the League of Nations, which we regard as the appropriate scale for the population of Great Britain.

TABLE I.—*Food Rations, Priority Allowances, and Certain Expected Distributions, per week (November, 1946)*

	Up to 1 year	1 year	2, 3 years	4 years	5–10 years	11–13 years	14–17 years	Normal Adult	Expectant Mother	Nursing Mother	Manual Worker (Male)	Manual Worker (Female)
Cheese (oz.) ..	2	2	2	2	2	2	2	2	2	2	2	2
Bacon (oz.) ..	3	3	3	3	3	3	3	3	3	3	3	3
Sugar (oz.) ..	8	8	8	8	8	8	8	8	8	8	8	8
Fats (oz.)	7	7	7	7	7	7	7	7	7	7	7	7
Bread (oz.) ..	35	35	35	63	63	91	91	63	77	63	105	77
Meat (cost) ..	8d.	8d.	8d.	8d.	1/4	1/4	1/4	1/4	2/–	1/4	1/4	1/4
Jam (oz.)	4	4	4	4	4	4	4	4	4	4	4	4
Milk (pints) ..	7	7	7	7	5½	5½	3½	2	9	7	2	2
Eggs (no.) ..	3	3	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~	~~3~~
Dried egg (oz.) ..	~~4~~	~~4~~	~~4~~	~~4~~	—	—	—	—	~~4~~	—	—	—
Sweets (oz.) ..	4	4	4	4	4	4	4	4	4	4	4	4
Points (no.) ..	8	8	8	8	8	8	8	8	8	8	8	8
M/Food orange juice	×	×	×	×					×			
M/Food cod-liver oil	×	×	×	×					×			

The distribution of milk and eggs to non-priority consumers has been taken as 2 pints and ½ per week respectively. Infants under 6 months do not receive the priority allowance of eggs.

For conversion into metric measures, 1 pint = 568 ml., 1 oz. = 28·35 g.

The most noteworthy features of the comparison are: *Children:* The rationed foods provide enough or more (*a*) of calories, protein, and iron up to 10 years, (*b*) of vitamins A and C up to 5 years, and (*c*) of calcium up to 2 years. *Expectant mothers:* The rationed foods provide enough or more of protein, calcium, iron, and vitamins A and C. *Nursing mothers:* The yield of all nutrients from the rationed foods is less than requirements. *Adolescents (14 to 17 years):* The amounts of all nutrients provided by the rationed foods are less than requirements. *Normal consumers and manual workers:* The amounts of protein, calcium, and iron in the rationed foods are roughly

* By rationed foods is meant those strictly rationed (e.g., meat, bread, fats, cheese, etc.), all "points," and milk and eggs the distribution of which is controlled.

about the same as, and of all other nutrients less than, requirements.

We now consider for each section of the population how the gaps between rations and needs can be made up. We confine our attention to energy—for brevity, and because experience of present diets has made it clear that, given all rations and enough unrationed foods to provide the energy requirements, the resultant diet is usually about sufficient in all the nutrients cited in Table II and in riboflavine and niacin, which are not included in the table.

Young Child.—It is clear from Table II that if children below the age of 5 were to consume all their rations they would get more than enough energy without eating any unrationed foods at all. It is the general custom, however, and from the nutritional point of view one to be commended, that children from about the age of 2 participate in the family meals. In this way they would probably obtain about 100 calories or more daily, depending on age, from the unrationed foods. It follows that children below 5 years should have 500 or more calories a day to spare from their rationed foods to go into the family pool.

School-child and Adolescent.—Up to the age of 14 years* the feeding of the school-child should present no problems. Indeed, between 5 and 10 years the rations alone yield more calories than are needed, and if a school meal is eaten the family pool could be enriched by the equivalent in calories and all nutrients. The gap between rations and needs is only about 300 calories between 11 and 13 years. This gap could be more than made good by the school meal, which is scheduled to supply up to 1,000 calories (Circular 1571, 1941, Board of Education). For adolescents between 14 and 17 years the gap is of the order of 800 calories or more. Adolescents who remain at school up to 18 and partake of the school meal should have no difficulty in satisfying their requirements. Those who leave school at 14 and go to work in a place provided with a canteen likewise should have little difficulty. For those with no such facilities it may not be easy to make good the gap of 800 or more calories. Certain categories of adolescents living in schools and colleges which are not eligible for school meal allowances can, on special application, get an extra allowance of three B.U.s weekly. These would provide about 215 calories daily, leaving still about 600 or more to be made up. How this could be done is shown in Table III. The special allowance of three extra B.U.s applies only when the student is in residence; when on vacation he is in exactly the same position as the adolescent who lives at home all the time and has no canteen or similar facility. It can be seen from Table III that such people may find it difficult to satisfy their needs unless there are younger children in the family with spare rations. The table shows that if he changes six of his eight points into B.U.s and eats 1½ lb. (680 g.) of potatoes a day he can just about reach his target. But if he requires more than 3,000 calories a day, as an active youth of about 16 may well do, it would be necessary to get a substantial helping from the family pool and/or change more points into B.U.s, to the detriment of the diet in a qualitative sense. If the adolescent's occupation entitles him to the designation "manual worker" then the extra 12 oz. (340 g.) of cheese and six B.U.s (630 calories daily) which he can get should make it easily possible for him to satisfy his needs.

Normal Consumer.—We need only consider the normal male. The energy requirement of the average man in a community as given by the League of Nations is 3,000 calories, a figure which includes all grades of work from sedentary to very heavy. For the purposes of the bread-rationing scheme most classes of manual workers from moderate to very heavy are included in the category of manual workers. The normal male consumer therefore embraces the large group of men whose activities vary from sedentary to light work, probably a very small number of the moderate work category, and a large number of oldish men whose requirement is mostly less than that of the sedentary class. Weighing up all these varying requirements, it seems reasonable to place the average needs of the normal male consumer at about 2,600 calories, but it should be clearly understood that this average figure covers a range which may well be of the order of 2,200–3,000. At the lower end of the range there would be no difficulty in securing enough, and there would almost certainly be a surplus to put into the family pool. At the top end of the range, however, there might be some difficulty in satisfying needs. If we place the needs of the ordinary male consumer at 2,600 calories he has to get 760, say 800, calories from unrationed foods or in other ways (see Table III). A meal taken in a restaurant should yield 600 calories or more, thus leaving about 200 calories to be made up from potatoes, etc. The figures in Table III make it clear that he should have little difficulty in doing this. If, however, he cannot get a restaurant meal he would have to change six of his eight weekly points into B.U.s and eat as much as 1½ lb. (680 g.) of potatoes daily to reach his requirements. This exchange would, however, impoverish his diet in a qualitative sense, and if he were to forgo the exchange he could probably get no more than about 500 calories from unrationed foods, thus leaving a gap of, say, 300 calories to be filled. Failing a family pool to dip into he would have to change all his points into B.U.s, eat more potatoes and other things such as sausages and fish if he can get them, or else go hungry.

Expectant Mother.—The rations of the expectant mother leave a gap of about 550 calories to be made good by potatoes, vegetables, fish, sausages, and offal, change of points into B.U.s, and, if need be, by dipping into the family pool. The way in which her diet could be brought up to the desired level of 3,000 calories is shown in

TABLE II.—*Nutrients Provided per Day by the Rations, Priority Allowances, and Expected Distributions of Milk and Fresh Eggs shown in Table I (November, 1946)*

Age in years or Ration Group:	Up to 1		1		2 and 3		4		5–10		11–13		14–17		Normal Male		Expectant Mother		Nursing Mother		Manual Worker (Male)	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Calories	1,776	800	1,776	1,100	1,745	1,300	2,029	1,500	1,995	1,900	2,279	2,630	2,199	2,970	1,842	2,600	2,440	3,000	2,085	3,000	2,268	3,500
Protein (g.)	60		60	42	57	46	67	50	64	60	74	85	69	99	56	70	85	80	69	80	70	70
Calcium (g.)	1·1		1·1	1·1	1·1	1·2	1·1	1·3	0·9	1·4	1·0	1·5	0·8	1·4	0·6	0·8	1·5	1·5	1·1	1·5	0·7	0·8
Iron (mg.)	9		9	5	8	7	10	8	11	11	13	16	13	15	11	10	13	13	11	13	14	10
Vitamin A (i.u.)	6,019		6,019	3,000	5,822	3,000	5,822	3,000	1,578	3,000	1,578	3,000	1,484	3,000	1,398	3,000	5,892	5,000	1,684	5,000	1,398	3,000
„ B (mg.)	0·77		0·77	0·50	0·74	0·59	0·92	0·68	0·87	0·86	1·04	1·18	0·90	1·01	0·77	0·91	1·10	1·82	0·92	1·82	1·03	1·21
Ascorbic acid (mg.)	33		33	30	33	30	33	30	6	30	6	30	5	30	3	30	49	45	8	45	3	30

A = Nutrients provided by foods in Table I. B = Requirements on the League of Nations scale.

* The school-leaving age has now been raised to 15 years.

Table III. It is assumed that she can eat 1½ lb. (680 g.) of potatoes daily. If she prefers bread she could obtain only enough to replace 1 lb. (454 g.) of potatoes by changing five more points into B.U.s, but the variety of her diet would suffer. This situation, however, would only arise with the first child. Children in the family up to about 14 would provide a substantial reserve of rations.

Nursing Mother.—The rations of the nursing mother leave a gap of about 900 calories. Her infant's rations amount to about 1,800 calories, whereas its requirements are about 800. The nursing mother could therefore meet all her needs from the rations of herself and her infant without consuming any unrationed foods.

Manual Worker.—The male manual worker is left with a deficit of about 1,200 calories to make up. Large numbers of manual workers have access to canteens. Actual surveys of meals supplied at canteens operated by a well-known catering firm show that in the autumn of 1946 meals and snacks served daily provided from 530 to 1,570 calories per head. The canteens in which the surveys were carried out were for workers ranging in activity from sedentary to heavy work. It would therefore seem from this finding that the heavy worker is able to get up to 1,500 calories daily at his canteen, thus filling the gap for the man requiring 3,500 calories. If the worker's diet were still insufficient for his needs he would have to have recourse to the means indicated in Table III—change of points to B.U.s, etc. The British Restaurant or other eating-places could be used if a canteen were not available at the place of work, but those who are out of reach of any sort of extra meals are not so well placed to fill the gap between rations and requirements. Certain classes of heavy workers, such as farm workers, quarrymen, and lumbermen, are allowed an extra 12 oz. (340 g.) of cheese and six B.U.s weekly, providing about 630 calories a day, thus leaving about 570 to be obtained from unrationed foods. Table III shows that they should be able easily to get about 1,260 calories, but they would need to eat 2 lb. (908 g.) of potatoes daily. If a workman required substantially more than 3,500 calories he would, unless he were able to extract a substantial amount from the family pool, have to change more of his points into B.U.s in order to reach, say, the 4,000-calorie goal. If he changed his remaining two points into B.U.s he would get an additional 100 calories, which would give him altogether 3,960 (2,300 + 1,560 + 100) (Table III). Knowledge of the energetic expenditure of the modern industrial worker is scanty. The only figures we possess date from before or shortly after the 1914–18 war. Since that time workmen's tools and conditions in industry generally have so altered that work is becoming less and less laborious, thus demanding less energy expenditure. It is very probable, therefore, that the numbers of people who require more than 3,500 calories a day are few and far between.

Miner.—The energy requirements of the miner are probably about 3,500 calories on the average. He is entitled to special rations of 12 oz. (340 g.) of cheese, 10d. worth of meat, and six B.U.s. These alone provide about 700 calories, leaving 500 calories to be made up from unrationed foods, which as Table III shows should present little difficulty. He would require to eat 1½ lb. (680 g.) of potatoes a day, but he need not change any points into B.U.s. Canteen facilities would, as in other instances, make it easy for him to secure his requirements. Those miners who require, say, 4,000 calories daily, and there may well be some, would obviously have less difficulty than the ordinary manual worker in attaining this or even a higher level of intake.

Hospital Patient.—There is no need to consider the patient suffering from complaints, such as peptic ulcer and diabetes, for which there are priority allowances. It will only be necessary to pay attention to those patients who are all relatively well, as in most hospitals these constitute the majority and require a fairly substantial diet. Broadly speaking, the rations of such a patient are the same as the domestic rations plus certain extras which the hospital patient gets. These extras amount approximately to the following: milk, 3 pints (1.7 l.); dried milk, 7 oz. (200 g.); fats, 2 oz. (57 g.); dried egg, 0.3 oz. (8.5 g.) weekly. These extras yield about 330 calories a day, and together with the amounts derivable from the ordinary rations make up a total of nearly 2,200 calories. The requirements for the average patient of the above type is probably about 2,500 calories, so that he has a gap of 300 calories, which can easily be filled in by unrationed foods (Table III). Even if there were no spare rations from patients who are on light diets there should be little difficulty in making up a diet to this level. In addition, certain other concessions have been made to hospitals—for instance, jellies, soft drinks, starch products; hospitals are also generally well placed to obtain supplies of fish and sometimes offal and poultry, all of which help to ease the burden of catering. The only account that has been taken of these concessions is that the allowance of fish in Table III has been placed at 3 oz. (85 g.) instead of 1½ oz. (42.5 g.) a day. Sick people are notoriously difficult to cater for, and the longer they remain in hospital the more exacting they become. In hospitals where the bulk of the patients are relatively well, and few are so ill as to be restricted to light diets, the provision of varied, appetizing, and adequate meals is a task demanding much ingenuity and artistry as well as knowledge of dietetics. In tuberculosis and orthopaedic

TABLE III.—*Bridging the Gaps between Rations and Requirements*

	Adolescent		Normal Male		Expectant Mother		Manual Worker (Male)		Miner		Hospital Patient	
	Amount per week	Calories per day	Amount per week	Calories per day	Amount per week	Calories per day	Amount per week	Calories per day	Amount per week	Calories per day	Amount per week	Calories per day
Rations		2,200		1,840		2,440		2,300		2,300		2,200
Requirements		3,000+		2,600		3,000		3,500+		3,500		2,500
Gap		800+		760		560		1,200		1,200		300
1. Canteen, school, or similar meals and snacks		1,000		600		600		1,500		1,500		—
2. Special B.U.s (No.)	3	215	—	—	—	—	6	430	6	430	—	—
3. Change points to B.U.s (No.)	6	300	6	300	1	50	6	300	—	—	—	—
4. Potatoes (oz.)	168	390	168	390	168	390	224	520	168	390	84	190
5. Vegetables and fruit (oz.)	56	50	56	50	56	50	56	50	56	50	56	50
6. Fish (oz.)	10½	20	10½	20	10½	20	10½	20	10½	20	21	40
7. Sausage or offal (oz.)	7	40	7	40	7	40	7	40	7	40	7	40
8. Extra cheese (oz.)	—	—	—	—	—	—	12	200	12	200	—	—
9. „ meat (oz.)	—	—	—	—	—	—	—	—	10½	100	—	—
Sum of Nos.	2–7	1,015	3–7	800	3–7	550	2 & 4–8	1,260	2 & 4–9	1,230	4–8	320
„ „	3–7	800	4–7	500	4–7	500	2–8	1,560	—	—	—	—

The rations of the expectant mother include her special allowances of meat, milk, eggs, and bread; the rations of the miner and manual worker (male) do not include the special allowances of cheese and meat, which are listed separately (see numbers 8 and 9) in Table III.

hospitals, for instance, the great majority of the patients are on full diet, and there are few, if any, spare rations.

Summary

The rations for each important section of the population have been evaluated and compared with the League of Nations scale of requirements. The comparison is summarized above.

In those instances where the yield of nutrients from the rationed foods is less than requirements, suggestions are made for meeting the deficit by one or more of the following, having regard to prevailing dietary habits: (*a*) consumption of unrationed foods; (*b*) canteen and similar meals; (*c*) exchange of points into B.U.s; and (*d*) the family pool.

In making these suggestions attention has been confined to energy requirements, because experience of wartime diets has shown that, given the full rations, the additional unrationed foods necessary to satisfy energy requirements also provide, or almost provide, a sufficiency of all important nutrients.

It has been found that the filling of the gap should present no great difficulty for the great mass of the population, who can, if necessary, supplement their rations from (*b*) and (*c*) sources; but it may not be easy for adolescent and other males whose requirements are above the average for their class and who are not entitled to special rations and cannot supplement their diet from sources (*b*), (*c*), *or* (*d*).

A SIMPLE FORMULA FOR THE CALCULATION OF ATMOSPHERIC DRYNESS

BY

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The following case, though an extreme one which occurred during the stresses of wartime, illustrates the fact that in British practice too little attention is usually devoted to the atmospheric conditions of operating theatres. They often get too hot, not only in summer-time but also in winter, when central heating is operated with more enthusiasm than discretion, and their humidity tends to rise with the addition of steam from sterilizers. The control of these conditions should be especially cared for in a place where the working staff are expected to maintain a high standard of mental alertness, and where the heat-regulating functions of the patient, like all the functions of his nervous system, are set in partial abeyance by anaesthesia.

Case Report

During the war an underground hospital was built with a view to its use in emergency. An anaesthetist was asked to comment on the suitability of the operating theatre it contained. The ventilation was far from efficient, and when the sterilizers were in operation and several people were working in the theatre the atmosphere became extremely hot and moist. The anaesthetist in his report pointed out that patients when anaesthetized tended to become poikilothermic, and that in such an atmosphere complications—for example, ether convulsions due to the breakdown of thermal equilibrium—would be likely. This report was not taken very seriously, and later the anaesthetist was required in circumstances which admitted of no denial to set to work in this operating theatre. Some 30 cases were operated on successfully. One day a man was brought in for operation on bilateral inguinal herniae.

He was a ship steward aged 31. His temperature was normal, pulse 60, respirations 18, and blood pressure 120/80. He had no history of previous illness. He was a perfectly healthy man except for the herniae which he wished to have operated on. After preliminary medication with omnopon and scopolamine, anaesthesia was induced by 0.75 g. of pentothal, and continued by 6 litres per minute of gas and oxygen (the latter in 25% concentration) with ether. After half an hour he was seen to be sweating profusely, as indeed everyone in the theatre was, and the volume of his respiration started to increase. The thermometer hanging on the wall registered 81° F. (27.2° C.) and the atmosphere was very moist. The total volume of gases delivered to the mask was increased to 12 litres per minute, still in 25% concentration, and after 45 minutes ether was discontinued. After 55 minutes the patient was red and sweating, the hyperpnoea was no better, and his pulse had risen to 126. The hernia on the right side was finished in 60 minutes, and at the request of the anaesthetist the operation on the other side was abandoned. On the patient's return to the ward his temperature was found to be 106° F. (41.1° C.), and his pulse 160. Cooling treatment was given, and oxygen and CO_2 administered. Within an hour he was dead. At necropsy no appearances other than those of heat-stroke were found. The underground theatre was not thereafter used.

Noteworthy features of this case are: (1) it was a case of pure heat-stroke, unaccompanied by any sign of convulsions; (2) there was no question of sweating being impaired by atropine; (3) there was no question of anoxic anoxia; (4) if the hyperpnoea led to any serious degree of CO_2 deficiency, this was combated by the administration of CO_2 in mixture; (5) there was no question of sepsis or pre-existing fever.

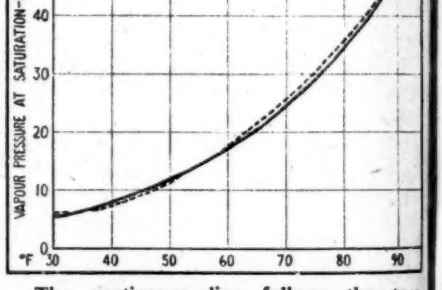
Calculation of Drying Capacity of Air

Moisture in the atmosphere is usually estimated by means of the "wet- and dry-bulb thermometers," which when exposed to an atmosphere not entirely saturated with water vapour will show readings differing by a certain number of degrees. The lower temperature of the wet bulb is caused by abstraction of heat in the process of evaporation of some of the water covering it. For scientifically accurate results the thermometers must be subjected to considerable air movement, and in America the "sling-psychrometer" is used for this purpose. The instrument is whirled through the air at a considerable velocity on the end of a sling. In England the usual open-air method is to expose the thermometers in a Stevenson screen, by which they meet with a slighter movement of the air; and in indoor conditions the thermometers are simply hung in a room in comparative calm.

The partial pressure of the water vapour contained in the air may be expressed in millibars by the empirical formula:

$$P = S^w - f\,\Delta$$

where P is the actual pressure in millibars of water vapour in the observed conditions, S^w the pressure at saturation point at the temperature of the wet bulb, Δ the difference in Fahrenheit readings between the two thermometers, otherwise termed the "depression," and f is a constant which depends on the pressure and velocity of the air passing over the bulbs. When using the sling psychrometer the value of this constant is 0.367; in England, for use with the Stevenson screen, the Air Ministry have adopted the value of 0.444. In the calm and not very precise conditions of thermometers suspended in interiors the round value of 1/2 is probably accurate enough.



The continuous line follows the true curve; the broken line indicates the curve: $y = \frac{1}{100}x^2 - \frac{1}{2}x + 12$.

The values of the partial pressure of water vapour under saturated conditions at various temperatures are well known,

and have been plotted in the form of a curve in the accompanying figure. When these values are expressed in degrees Fahrenheit and millibars, it will be seen that the curve of saturation pressures between the temperatures 30° and 90° has a remarkable similarity to the parabola:

$$y = \tfrac{1}{100}x^2 - \tfrac{1}{2}x + 12.$$

The greatest error introduced by using this equation occurs in the neighbourhood of 76° F., at which the true value of the saturation pressure is 30.66 millibars, and the value calculated by the equation is 31.76, an error of a trifle over 1 millibar. Elsewhere this error decreases, and at three points over the indicated range the calculated value coincides with the true value.

Using the equation, one may write:

$$S^w = \tfrac{1}{100}W^2 - \tfrac{1}{2}W + 12$$

where W is the temperature Fahrenheit of the wet bulb. Hence, from the formula $P = S^w - f\Delta$, and taking $f = \frac{1}{2}$,

$$P = \tfrac{1}{100}W^2 - \tfrac{1}{2}W + 12 - \tfrac{1}{2}\Delta.$$

But $\Delta = D - W$, where D is the temperature Fahrenheit of the dry bulb, and the formula thus becomes:

$$P = \tfrac{1}{100}W^2 - \tfrac{1}{2}D + 12.$$

Partial saturation of the atmosphere by water vapour is usually expressed in terms of "relative humidity," which is the ratio of its actual vapour pressure to the pressure which would be attained by saturation at the same temperature, expressed as a percentage. Using the term H for relative humidity, and S^d to express the saturation pressure at the temperature of the dry bulb, one may thus write:

$$H = 100\frac{P}{S^d} = 100\frac{\frac{1}{100}W^2 - (\frac{1}{2}D - 12)}{\frac{1}{100}D^2 - (\frac{1}{2}D - 12)}$$

Thus, as may be seen, to estimate the relative humidity the only figures required are the squares of the thermometer readings, each divided by 100 and diminished by half the dry-bulb reading less 12. For example, if the dry bulb reads 60° F. and the wet bulb 55° F., half the dry-bulb reading less 12 will equal 18, and subtracting from each of the squares the relative humidity is found to be:

$$100\frac{30{\cdot}25 - 18}{36{\cdot}00 - 18} = 68\%.$$

If the dry bulb reads 71° F. and the wet bulb 67° F., the relative humidity is found to be:

$$100\frac{44{\cdot}89 - 23{\cdot}5}{50{\cdot}41 - 23{\cdot}5} = 79\%.$$

The relative humidity is, however, not a very valuable figure if, as is usually the case, it is desired to estimate the capacity of the air to absorb moisture, since the total capacity of the air varies greatly at different temperatures, and at low temperatures is so small that even a small relative humidity does not indicate a great residual ability to absorb moisture.

For practical purposes the drying capacity of the air is better expressed as the "saturation deficiency," or the number of millibars by which the partial pressure of the water vapour actually present falls short of the saturation pressure at the same temperature. This figure, expressed in terms of the equation, becomes:

$$S^d - P = (\tfrac{1}{100}D^2 - \tfrac{1}{2}D + 12) - (\tfrac{1}{100}W^2 - \tfrac{1}{2}D + 12)$$
$$= \tfrac{1}{100}(D^2 - W^2)$$
$$= \tfrac{1}{100}(D + W)(D - W).$$

The above expression, which might be called the "index of drying power" of the air (and approximates the true value of the saturation deficiency in millibars), thus becomes a figure which can rapidly and easily be calculated direct from the thermometer readings without the help of tables, should these not be available. For example, the thermometers might show readings of 50° F. and 45° F. Multiplying the sum by the difference, and dividing by 100, the index of drying power is found to be 4.75. In another place they might show 75° F. and 68° F.; by the same calculation the index is found to be 10.01. In the second case, though the depression of the wet bulb is only 2° F. greater, the air has more than twice the drying power.

Discussion

Wet- and dry-bulb thermometers are rarely seen in operating theatres; but I would suggest that were they more commonly used, and the proposed simple calculation of the index of drying power carried out from time to time in conjunction with readings of the dry bulb, the results might in many cases prove illuminating. The importance of the wet-bulb temperature was long ago pointed out by Haldane (1905), who found that, whatever the dry-bulb temperature, heat-regulation would begin to break down when the wet-bulb temperature rose above 88° F. (31.1° C.). Probably 70° F. (21.1° C.) should be regarded as the upper limit of safety in an operating theatre.

The hazards of hot and moist atmospheres have been emphasized, but those at the other extreme are scarcely less important. Cold surroundings will produce or aggravate surgical shock, and a very dry atmosphere will facilitate the production of high static electrical potentials, with a corresponding risk of explosion of inflammable vapours. Such dryness is but rarely encountered in Great Britain, but I have on at least one occasion heard the crackle of a static discharge in a theatre when a dry blanket was quickly pulled away from a trolley.

The formula ($P = S^w - f\Delta$) and the figures for partial pressures are taken from the Air Ministry Hygrometric Tables, M.O. 265 (1940), published by H.M. Stationery Office, and I have to thank the Director of Bidston Observatory for drawing my attention to that useful publication.

Summary

It is pointed out that an assessment of the drying capacity of the air can be made by a no more complicated procedure than finding the product of the sum and difference of the wet- and dry-bulb readings.

It is suggested that the atmosphere of operating theatres should be more rigorously investigated and controlled.

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TRAUMATIC URAEMIA: RECOVERY

BY

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AND

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Below is reported a case in which a penetrating wound of the right thigh with division of the femoral artery and vein, without any apparent injury to the abdomen or left leg, led to an ischaemia of both legs. This was followed by a great increase of blood urea and other signs suggesting the onset of traumatic uraemia. After splanchnic block the blood urea fell and the general condition improved sufficiently to permit amputation of both legs. Following amputation progress was uninterrupted. Trueta and others (1946) suggest that splanchnic block should prove of value in

traumatic uraemia. The result in this case seems to give some support to that suggestion.

Case Report

The patient, an agricultural worker aged 65, was found lying in a pool of blood after his horse and cart had returned to the farm without him. As he was alone no details of the accident were available. It seems likely that the cart passed over his right leg.

He was admitted on July 5, 1946, about two hours after the injury, *in extremis*, with no ascertainable pulse or blood pressure. The only visible injury was a small puncture wound of the inner side of the right thigh. There was no bleeding from this wound on admission. *X*-ray examination showed no bone injury. The transfusion of 5 pints (2.8 l.) of plasma and 1 pint (0.57 l.) of blood (group B) raised the blood pressure to 110/60. No other immediate treatment was given.

On the morning after admission it was obvious that there was no circulation or sensation in the right leg below the knee. The left foot, in which the circulation had appeared satisfactory on the previous evening, now showed cyanosis of the toes. The popliteal pulse was palpable, but neither the posterior tibial nor the dorsalis pedis could be felt. There was no evidence of injury to this leg. The transfusion cannula had been inserted in the left ankle. Routine treatment for vascular injury was carried out—that is, heat to trunk, exposure of limbs, no smoking, 1 oz. (28 ml.) of brandy or whisky four-hourly. In view of impending gangrene of the right leg and the failing circulation of the left leg, exploration of the wound was considered advisable. This was carried out about 22 hours after the injury. There was considerable muscle damage, and the femoral artery and vein were completely divided at the junction of the middle and lower thirds and thrombosed. The wound was excised and closed with drainage after "icing" with proflavine–sulphathiazole powder. The following day the patient's general condition was poor. He was at times irrational and incontinent. The fluid intake was maintained—102 oz. (2.9 l.). The output was difficult to assess because of incontinence, but appeared to be lowered—20 oz. (0.6 l.). The blood pressure rose to 145/80. The general condition was about the same on July 8. The right leg was avascular to the knee, and the left avascular to the level of the ankle. The blood urea was 168 mg. per 100 ml.; plasma chloride, 525 mg. NaCl per 100 ml. (90 m.-equiv./litre); plasma bicarbonate, 56 vols. per 100 ml. (25 m.-equiv./litre); plasma protein, total, 5.42 g. per 100 ml. (albumin, 3.52 g.). The fluid intake was 84 oz. (2.4 l.) and the output 49 oz. (1.4 l.).

In view of these findings splanchnic block was advised, being carried out by Dr. MacKay of the department of anaesthetics; 40 ml. of 5% "novocain" was injected by the post route under 0.2 g. of thiopentone. After the injection the blood pressure dropped 20 points. Investigations on subsequent days were: July 9: blood urea 184 mg. per 100 ml. haemoglobin (?) (specimen taken soon after splanchnic block); July 10: 128 mg., 50%; July 11: 96 mg., 42%; July 13: 72 mg., 50%; July 15: 80 mg., 40%; July 19: 50 mg., 62%.

On July 18 the difficulty with regard to measuring fluid output persisted. The general condition of the patient remained about the same. There was general emaciation but otherwise no serious deterioration. Gangrene of both legs was well developed. The right leg was dry, requiring above-knee amputation. There were some blisters on the left leg and mild cellulitis. An above-knee amputation of the right leg was performed and 2 pints (1.1 l.) of blood was given. Next day the general condition improved, and he was rational for longer periods. The pulse was 110; blood pressure 130/80; haemoglobin 62%; blood urea 50 mg. per 100 ml. On the 24th the haemoglobin was 64% and the blood urea 28 mg. per 100 ml. A below-knee amputation of the left leg was made on the 25th and 2 pints (1.1 l.) of blood were given. On July 31 the haemoglobin was 84%.

Since the second amputation the progress has been uneventful. Incontinence has completely ceased, and the patient is rational; he eats and sleeps well, and the stumps are practically healed.

REFERENCE

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MASSIVE PENICILLIN DOSES IN GENERAL PRACTICE

BY

D. P. WHEATLEY, M.B., M.R.C.S.

In the *Journal* of Nov. 30, 1946 (p. 842), it was stated that the writer knew of no comparative data for larger doses of penicillin than 100,000 units, or of such doses at infrequent intervals. I venture, therefore, to record a few minor conditions treated by this method in general practice.

Case Reports

Case 1.—Mrs. S., aged 45, had been troubled for some time with recurrent and severe boils in the nose. The usual duration of one of these was one to two weeks. Two days before I saw her one had started, and she consulted me as she was particularly anxious to go away for a week-end two days later. She had a full-blown and very painful boil just inside her nose. I gave her 200,000 units of penicillin by intramuscular injection, this being repeated the following day. The next day the boil had almost completely subsided, and gave her no further trouble.

Case 2.—Mr. P., aged 32, had had a large whitlow on the third finger of his left hand for three days. It was already discharging, but the whole finger was grossly reddened and swollen. In addition, he felt unwell, and an eruption of small furuncles had broken out all over his body. He was given 200,000 units of penicillin. The next day he felt very well in himself, although there was no significant change in the whitlow. A further 200,000 units was administered, and the following day the whitlow was discharging profusely, most of the swelling had subsided, and the furuncles had almost disappeared. Two further injections of 200,000 units were given, and he was able to return to work one week after the beginning of the infection. He was seen a week later, when the finger was practically healed.

Case 3.—Mr. S., aged 42, had had a severe carbuncle just below his left elbow for three days; there was much inflammation, and several heads were beginning to form. He felt unwell, and had a slight temperature. He was given 200,000 units of penicillin. The next day he felt much better, his temperature had fallen, and the heads of the carbuncle had increased in size and were already discharging. A further dose was given, and the next day the lesion was discharging profusely, much of the inflammation had subsided, and the patient was later able to express the main core of the carbuncle. Two further injections were given, and a week later (ten days from its onset) the lesion had completely subsided. No local treatment was given.

Case 4.—Master P., aged 5, had had a purulent conjunctivitis, gradually getting worse over a period of one week. When seen his left eye was completely closed, much swollen, and a purulent exudate oozed from under the lids. He was given 50,000 units of penicillin. The next day he was able to open the eye and much of the swelling had gone down, although there was still a purulent discharge. Two further doses of 50,000 units were given on the following two days. The eye was then perfectly normal, except for one or two small tags of crusted exudate on the lashes.

Case 5.—Miss F., aged 12, had a large stye on the lower lid of her left eye. This had been treated with ung. hyd. oxid. flav., and had all but cleared up when it broke out again. There was a similar occurrence after penicillin ointment. In all, she had suffered from the stye for a period of two weeks. A single injection of 200,000 units of penicillin was given, but she declined a further injection, as she did not relish the procedure. As it happened, this was not necessary, for by the next day the condition had cleared up.

Case 6.—Mr. G., aged 52, developed a carbuncle on his neck, following an eruption of boils; he had never had either before. When first seen the carbuncle was of ten days' duration. He had several small healed boils, and another carbuncle, three days old, was forming on his right thigh, so far without a head. He was given four daily injections of 200,000 units each of the highly purified white crystalline penicillin. At the end of

this time only a scar remained at the site of the carbuncle on his neck; the one on his thigh had completely aborted.

Case 7.—Mr. K., aged 41, had had a carbuncle on his right forearm for five days. He complained of pain up the arm and in the axilla. He was anxious to return to work as soon as possible, and 200,000 units of penicillin was given twice daily for three days, and a single dose on the fourth day. By this time the swelling had nearly subsided and the carbuncle was discharging freely.

Comment

The successful treatment of the above cases would seem to justify the use of large doses of penicillin at infrequent intervals, such as can conveniently be carried out in general practice. The particular dosage was chosen on the grounds of economy; larger doses might be even more effective and might possibly be of use in more serious conditions. In Cases 3, 6, and 7 the carbuncles cleared up in about five days and the patients were fit for work within a week; indeed, one patient continued working, though against advice, during treatment. This is an important consideration when the cost of the treatment is taken into account.

The introduction of the more highly purified white crystalline penicillin will probably greatly increase the value of this form of treatment.

Summary

Seven cases of minor conditions commonly met with in general practice, yet which had responded poorly to routine treatment, have been described. All responded strikingly to large daily injections of penicillin. In each case it was considered that there was a clear indication for this form of therapy; and in none was any local treatment given after starting penicillin therapy. It is of interest to note that the one patient who was given injections twice daily did no better than the others. In the few cases so far treated by this method no failure has been observed.

Medical Memoranda

A Case of Thrombosis of the Abdominal Aorta

The following case of thrombus formation on an atheromatous ulcer of the abdominal aorta immediately above the bifurcation of the common iliac arteries is thought worthy of record because of the disparity between the gross pathology and the symptoms produced. A remarkable feature was that in spite of a massive arterial occlusion no pain was experienced. Boyd (*Textbook of Pathology*, 4th ed., 1943) states that thrombus formation on an atheromatous ulcer of the aorta occurs much less frequently than might be expected.

Case Record

A man aged 47 was admitted to the Falkirk Royal Infirmary complaining of numbness and coldness of both lower limbs of three days' duration. Seven days previously, while climbing a steep hill, he was seized with a pain in the left praecordium, extending down the left arm to the wrist, and a feeling as if his left leg was swelling and about to burst. After resting for half an hour he continued to climb the hill although the rest had not relieved the pain. On reaching the top he broke out in a cold clammy sweat and felt as if both legs were swelling to bursting point. His legs would no longer support him and he had to sit down and was later taken home in a taxi. In bed, apart from his legs and some residual precordial pain, he had no complaint. The legs were normal in colour and muscle power was normal. The next day the precordial pain and the numbness in his legs disappeared. On the third and fourth days he had no complaint whatsoever, although he remained in bed. On the fifth day he suddenly broke out in a cold clammy sweat and his right leg became numb and cold from "the sole of the foot to the hip." The leg became discoloured and muscle power was lost. *There was no pain.* Later that day his left leg from the sole of the foot to the knee became gradually numb and cold. Again pain was conspicuous by its absence. He also became incontinent of urine and faeces. Two days later he was admitted to the infirmary. On two occasions, two months previously, he had experienced slight pain in the calves of both legs on climbing a hill. This passed off quickly after rest.

On admission he was seen to be a well-built man whose face was somewhat congested and who had a fair degree of clubbing of the fingers. The right leg showed marked discoloration and was cold and pulseless. The line of demarcation was about 5 cm. below the inguinal ligament. There was complete loss of sensation and muscle power. The left leg was similarly affected immediately below the knee-joint. The heart was irregular in rhythm and force and the heart sounds were of very poor quality. The blood pressure was 110/80. Examination revealed no abnormality of any of the other systems. The Wassermann reaction was negative. He died some nine hours after admission.

Post-mortem Examination.—There was an atheromatous ulcer about 2 cm. in diameter on the anterior wall of the aorta about 4 cm. above the bifurcation of the common iliac vessels. It had involved the intima and media and was on the point of rupturing through the adventitia. There was a large adherent thrombus over the site of the ulcer, which extended down both iliac vessels to their bifurcation and involved 2 cm. of the left internal iliac. There was also a great deal of patchy calcification over the area covered by the thrombus. Proximal to this the aorta appeared normal, as did the other arteries. The heart was dilated and showed a marked fibrosis of the myocardium, the wall of the right ventricle being parchment-like. The right ventricle showed an old coronary thrombosis. An interesting feature was the complete absence of rigor mortis of the affected limbs.

I am indebted to Dr. T. Kay Maclachlan, Consultant Physician, Falkirk Royal Infirmary, for permission to publish this case.

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A Case of Dissecting Aortic Aneurysm Diagnosed Clinically

In view of the infrequency of the clinical diagnosis of cases of dissecting aortic aneurysm, I am grateful for an opportunity to publish this case. Dissecting aortic aneurysms are comparatively rare lesions, and particularly so in women; the incidence in men to women is three to one (Paul White, 1946).

Case Report

A well-nourished obese woman aged 40 was admitted to hospital at midnight on Jan. 24, 1947. The patient was in an acute state of shock. She was ashen grey, clammy, and perspiring; her pulse rate was about 100, irregular, and of very poor volume. It was impossible to record the blood pressure in the right arm, but the systolic pressure in the left arm was 70 mm. She was very restless, but was able to give her history fairly well. This was as follows. At 12 noon on Jan. 24, suddenly, after a very heavy morning's work, she experienced a "terrible pain" between the scapulae and radiating slightly towards the back of the neck; she fell into a chair. She vomited twice, and when seen at 2.30 p.m. the same day by her husband she was acutely shocked and "helpless"; she coughed a very small amount of bright-red blood. The only relevant past history was that she had had a cough for the last three weeks, but otherwise was well and active. She had five children alive; in the case of the youngest child, labour was induced at the seventh month for "kidney trouble and blood pressure."

Clinically it was impossible to determine the size of the heart, and the heart sounds were almost inaudible. There were no abnormal physical signs in the lungs, abdomen, or central nervous system. The fundi showed arteriosclerotic changes, and no exudates were seen. It appeared that this patient had had an acute circulatory catastrophe. Coronary thrombosis seemed a possible alternative diagnosis, but the site and nature of the pain in the back and its maximum intensity at the onset were both points in favour of a dissecting aneurysm. She died at 11 a.m. on Jan. 25.

Post-mortem Findings.—The pericardium was considerably thickened and there was a large haemopericardium. The weight of the heart was 25 oz. (0.7 kg.), and the left ventricle was hypertrophied. There was a break in continuity of the intima of the aorta in the transverse portion opposite the origin of the innominate artery; this was some 1/2 in. (1.25 cm.) long in the longitudinal direction. This break was continuous with a cavity in the wall of the aorta and dissected about one-half the circumference of the aorta. The cavity contained blood clot, and extended down to the aortic valves. The coronary arteries were fairly healthy. There was extensive atheroma of the intima of the aorta, more marked distally. The left kidney was small, with the capsule adherent, and its surface was slightly granular.

I wish to thank Dr. E. H. Brindle for permission to report the case, and Dr. J. R. Mackenzie for much helpful criticism.

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Reviews

"A VERY PRACTICAL SCIENCE"

Fundamentals of Immunology. By W. C. Boyd, Ph.D. Revised reprint. (Pp. 446; illustrated. 33s.) London: Staples Press, Ltd.

Immunology is indeed, as Prof. Boyd writes in his first chapter, "a very practical science, concerned with methods of preventing disease or influencing its course," but it touches clinical medicine at unrelated points. In a few instances prophylactic inoculation is useful; antisera, of which we once hoped so much, are effective in still fewer; various serological reactions are used in diagnosis. Nevertheless we learn from the Rh reactions that what may now seem merely test-tube serology may at some time become the key to the aetiology and treatment of a serious disease. Until more is known of the physical chemistry of proteins and of the nature of inter-molecular forces many events in serology will remain disconnected.

In teaching students this complicated subject, any detail of which may prove to be of vital importance, Prof. Boyd considers that the chief emphasis should be on serology, "if by that we mean the science which studies the fundamental mechanism of immunological reactions and their theoretical foundations." He recounts fully our present knowledge of antibodies, the relation of the specificity of antigens to structure, and the nature of antigen–antibody reactions. Some of the more advanced material is printed in small type to distinguish it from that "which the beginner can and should be expected to master," but even the remainder is more than any beginner could digest. Prof. Boyd, who does not oversimplify his subject, modestly hopes that the book will be of some use to the professional immunologist. He might have claimed much more: the book should be of the greatest value to any who are engaged in or intend to take up immunology as a special study. He presents the theoretical aspects of the subject fully and clearly, and has co-ordinated much material that previously lay scattered about the literature. The book is written in his usual agreeable style.

J. R. MARRACK.

NUTRITION

Food and Health. An Introduction to the Science of Nutrition. By A. Barbara Callow, M.Sc., M.S. Third edition. (Pp. 184; illustrated. 6s.) Oxford: The Clarendon Press. 1946.

Food Control and Nutrition Surveys, Malabar and S. Kanara. By K. G. Sivaswamy, *et al.* (Pp. 225. Rs. 4.) Madras: Servinda Kerala Relief Centre, Royapettah.

Inadequate Diets, Deaths and Diseases, and a Food Plan for Madras. By K. G. Sivaswamy, *et al.* (Pp. 84. Rs. 2.) Madras: Servants of India Society, Royapettah.

The first of these books is an introduction to the science of nutrition designed for students and the general reader and is particularly relevant in these days of world food shortage. The previous edition has been largely rewritten. In addition to the facts usually found in a book on nutrition there is useful information on choice of foods, special diets, the effect of cooking on nutritive value, and very extensive food tables. As a short survey for the general reader this book is strongly recommended.

The authors of the two books from India discuss the appalling malnutrition and morbidity in some of the States—where indeed in certain areas the death rate is higher than the birth rate. The books are well documented and contain precise suggestions for improving the health and diet of the masses—such as the growing of more food, the subsidizing of agriculture and a basic diet for the poor, the control of food, rents, and wages, and an increase in the purchasing power of the poor.

BASAL METABOLISM

Hypometabolism. A Clinical Study of 308 Consecutive Cases. By Esben Kirk, M.D., and Sven Ancher Kvorning, M.D. (Pp. 84. Dan. Cr. 7.25, or 7s. 6d.) Copenhagen: Einar Munksgaard. London: Heinemann Medical Books. 1946.

The authors have studied the basal metabolism of the majority of patients admitted to the medical department of the Holstebro District Hospital in Denmark during the years 1940, 1941, and 1942. They have not recorded the number of patients investigated, but in 308 cases the basal metabolic rate was found to be below 88% of normal. An analysis of the findings from the clinical examination of these 308 patients is the subject matter of this monograph. In 30 myxoedema or cachexia strumipriva was the cause of their hypometabolism; in 44 there was reduced physical activity, the patient often being bed-ridden; in 41 the intake of food was greatly reduced. Low basal metabolism is expected in these three groups.

Of greater interest is the number of women with "hypogonadism" in the series; these, mainly patients whose ovaries had been removed or who suffered from oligomenorrhoea, constituted 21% of the total. The mechanism of their reduced metabolism is uncertain, but secondary hypothyroidism is a possibility. In the largest group—109 patients—21 were considered to be healthy, while the remainder had various ailments not usually thought to affect the metabolism. The metabolic rates of a random sample of this group conformed to the left-hand section of an ideal distribution curve the right-hand section of which was obtained from control cases. The authors believe these had a "physiological hypometabolism," and suggest that some healthy individuals may have basal metabolic rates considerably below "normal."

R. BODLEY SCOTT.

X RAYS IN UROLOGY

Urologic Roentgenology. By Miley B. Wesson, M.D. Second edition; thoroughly revised. (Pp. 260; 258 engravings. 27s. 6d.) London: Henry Kimpton. 1946.

Although no great advance in *x*-ray examination of the urinary tract has been made since the previous edition of this book, technique has steadily improved. With the help of the radiologist it is now possible to diagnose lesions formerly discovered only at operation—a striking example being that comparatively rare lesion, renal aneurysm. The author has replaced many of the old illustrations with new, rewritten most of the text, and included the latest references. Comparison of the old plates with the new reveals the progress in this branch of medicine. This is certainly the finest collection of urological *x*-ray illustrations that have appeared in any book, and the text is lucid and concise.

Our only criticism is that the author is occasionally rather dogmatic. This is particularly noticeable in the chapter on hydronephrosis, from which the inexperienced reader may easily conclude that all forms of hydronephrosis are caused by obstruction and that the nature of the obstruction can usually be discovered, whereas in many cases the precise aetiology remains obscure. However, as the author points out in his preface, dogmatism in a book of this type has certain advantages. His aim is "not to supply a treatise but to provide a vade-mecum which will help the newcomer in urologic roentgenology to interpret his pictures." Dr. Wesson admirably achieves this end. His book can be highly recommended not only to the general reader but to specialists in this particular subject.

K. WALKER.

APHORISMS ON CANCER

Quelques Vérités Premières (ou soi-disant telles) sur le Cancer. By René Huguenin. Preface by M. Gustave Roussy. (Pp. 140. 200 francs.) Paris: Masson et Cie. 1946.

This book on basic truths about cancer is one of a series designed to present the fundamental truths of medicine, so far as they are at present recognized, in the form of aphorisms reminding practitioners of rules of practice which they should not lightly transgress and indicating to students what is of capital importance in their studies. The form of presentation is of doubtful value; nevertheless Huguenin writes with the authority of wide experience, and much of what he says is stimulating. As it stands, the book is an interesting supplement to orthodox textbooks.

After a general discussion of the nature and origin of cancer there is a section on the diagnosis of the individual varieties. A chapter on the habits of growth and spread of cancer leads to a discussion of therapeutic measures, and a final short chapter is devoted to cancer as a social problem. The emphasis of the book is on early, exact, and complete diagnosis and on judicious choice of treatment. Huguenin insists that in its early stages cancer presents no distinctive clinical signs or symptoms; the orthodox textbook descriptions apply

to advanced stages and are commonly useless or even misleading in the quest for early diagnosis. There is no single method of treatment appropriate to all kinds of cancer. Correct choice of treatment, upon which the patient's life depends, requires precise knowledge of the type of the tumour, its extent, its usual habits of growth and dissemination, and of concomitant lesions. A diagnosis which is sufficiently early and exact can often be established only by histological examination, and he is a warm advocate of biopsy, and especially of "per-operative" biopsy, in the theatre, with the surgeon prepared to act promptly on the findings. He discusses the knowledge and skill required from surgeon and pathologist to ensure reliable results and the subsequent procedure to minimize the risks of biopsy. Huguenin is impressed by the importance of general and local conditions favouring or impeding the growth and spread of cancers, though dearth of knowledge of these factors precludes, at present, the influence on therapeutics which they may exert in the future. The isolation of French medicine during the war no doubt accounts for the cursory reference to treatment of carcinoma of the prostate by oestrogens, and the author seems to write without personal acquaintance with the method. Personal experience and reflection inform the rest of the book.

L. FOULDS.

ACTION OF DIGITALIS

La Digitale et Les Strophantines. Pharmacodynamie-Thérapeutique. By D. Danielopolu. (Pp. 206; illustrated. No price given.) Paris: Masson et Cie. 1946.

It is interesting to read the opinions of an author from Bucharest on such a subject as the action of digitalis; we learn how different his standpoint is from ours. He does not regard as important the increased force of ventricular contraction that digitalis causes, nor does he discuss its action in depressing conduction in the bundle of His; he says nothing of digitalis causing a reduction in the number of impulses reaching the ventricle from a fibrillating auricle, or of an extra-cardiac action of digitalis whereby increased venous tone reduces the venous pressure at the entrance to the right auricle.

Danielopolu is chiefly concerned with the relation between the digitalis glycosides and acetylcholine, and he shows from a series of experiments that in the presence of strophanthin the effect of acetylcholine and of vagal stimulation is strikingly increased. This augmentation of the action of acetylcholine is seen in both cardiac and many other tissues in the presence of, for example, strophanthin in concentrations which, it must be said, are rather high. Though increased vagal action slows the heart, few to-day consider that vagal slowing is closely connected with the beneficial action of digitalis. However, we tend to overlook the observations made by Lewis, Drury, and Iliescu, which seemed to puzzle those who made them, that when atropine is injected into the vein of a fully digitalized patient with fibrillation there is a sudden large acceleration in the ventricular rate from 70 or 80 to 160 or even 180. There may therefore be more truth in Danielopolu's viewpoint than we usually admit. Increased acetylcholine action may, however, affect more than the heart rate, for it is becoming apparent that all substances which prolong the refractory period and diminish conduction in cardiac muscle are acetylcholine antagonists, and that acetylcholine not merely inhibits the heart but is concerned in the transmission of the contractile process and perhaps in the contractile process itself. If that should prove correct, the importance of the relation between digitalis glycosides and acetylcholine will be firmly established.

J. H. BURN.

Volume LXV of the *Transactions of the Ophthalmological Society of the United Kingdom* for the session 1945 has been published by J. and A. Churchill at 40s. It comprises full reports of the proceedings of that society at the annual congress held in London in April, 1945; it also includes the Doyne lecture and other papers read before the Oxford Ophthalmological Congress at its thirty-first annual meeting. Among the main subjects dealt with in this volume are ocular sequelae of head injuries; plastic repair of the lids; traumatic detachment of the retina; the sympathizing eye; compression and invasion of the optic nerves and chiasma by neighbouring gliomas (Geoffrey Jefferson's Doyne lecture); injuries to the eyeball; and retrobulbar neuritis (paper by L. E. Werner read to the Irish Ophthalmological Society).

BOOKS RECEIVED

[*Review is not precluded by notice here of books recently received*]

Allergy in Theory and Practice. By R. A. Cooke, M.D., Sc.D., F.A.C.P., *et al.* (Pp. 572. 40s.) Philadelphia and London: W. B. Saunders. 1947.

The authors discuss allergy in all its aspects and intend the book for general practitioners as well as specialists.

A Plan for Science. By the Science Advisory Committee of the Communist Party. (Pp. 32. 6d.) Watford: Farleigh Press. 1947.

A memorandum on the application of science to industrial and social problems.

Diseases of the Retina. By H. Elwyn, M.D. (Pp. 587. 45s.) London: Churchill. 1946.

The author discusses disturbances in circulation, vascular malformations, degenerative and inflammatory diseases, tumours, retinal detachment, developmental abnormalities, and radiation injuries.

Le Problème Biologique du Cancer. By J. Delarue. (Pp. 200. 300 francs.) Paris: Masson. 1947.

The author considers the aetiology of cancer, experimental evidence, the pathology and clinical aspects, and the treatment of cancer.

Le Chirurgien en présence de l'Etat Diabétique. By J. Bréhant. (Pp. 541. 1,200 francs.) Paris: Masson. 1946.

Includes discussion on surgical procedures for diabetic patients, surgical complications of diabetes, surgical treatment of diabetes, and traumatic diabetes.

L'Epilepsie Chronique. By P. Hartenberg. (Pp. 160. 240 francs.) Paris: Masson. 1946.

A monograph on the aetiology and symptomatology of idiopathic epilepsy.

Le Problème des Tuberculoses Atypiques. By R. Burnand, *et al.* (Pp. 435. 760 francs.) Paris: Masson. 1946.

A collection of studies on atypical tuberculosis, including tuberculosis of the skin and the lungs, and discussion of the anatomy, pathology, and bacteriology.

Le Diabète et sa Pathogénie. By L. Ambard. (Pp. 162. 240 francs.) Paris: Masson. 1946.

A monograph on the pathogenesis, symptomatology, and treatment of diabetes.

Tuberculosis in Newfoundland. By T. O. Garland, M.D., D.P.H., and P. D'Arcy Hart, M.D., F.R.C.P. (Pp. 58. No price.) Newfoundland: Trade Printers and Publishers. 1946.

A report of an investigation into tuberculosis in Newfoundland, where the disease is particularly widespread.

Anatomy and Physiology. By C. F. V. Smout, M.D. 2nd ed. (Pp. 470. 30s.) London: Edward Arnold. 1947.

This book is planned in accordance with the syllabus of the Chartered Society of Physiotherapy and is intended for students of massage and medical gymnastics.

La Psychologie de L'Intelligence. By Jean Piaget. (Pp. 212. 80 francs.) Paris: Armand Colin. 1947.

After discussing intelligence in adaptive processes the author considers its relation to perception, habit, and in the elaboration of thought.

Studies on the Influenza A-Epidemic of January–March, 1941, at Groningen (Holland). By J. A. R. Van Bruggen, M.D., *et al.* (Pp. 79. 10s.) Leiden: Stenfert Kroese.

A monograph on an influenza epidemic in Holland, with photographs, from the Leiden Institute of Preventive Medicine. In English.

A History of the Worcester Royal Infirmary. By W. H McMenemey, M.A. (Pp. 356. 21s.) London: Press Alliances. 1947.

The author stresses the value of democratic management and local enterprise as well as the need for nation-wide planning.

Heparin in the Treatment of Thrombosis. By J. E. Jorpes, M.D. 2nd ed. (Pp. 260. 18s.) Oxford University Press: Geoffrey Cumberlege. 1946.

A survey of the chemistry, mode of action, and therapeutic uses of heparin for the physiologist and physician.

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BREAD RATIONING AND CALORIES

So long as bread was not rationed everyone could get as many calories as he wanted. Not everyone actually got as many calories as he did before the war, partly from dislike of the food that could be bought, partly from a permanent failure to adapt—similar to the temporary failure shown by McCance and his colleagues[1] in their experimental study of rationing. But one of the objects of rationing bread was to reduce the consumption of grain. If consumption is reduced can people still obtain as many calories as they want? Bransby and Magee (p. 525) set out to answer how males and females of different ages and activities can keep their intake up to the level recommended by the Technical Committee of the League of Nations. They estimate the number of calories supplied by rations —that is, by those foodstuffs of which the supply is restricted by regulations. In some cases the rations by themselves supply all the calories needed. In the case of "normal" males, adolescents, manual workers, and pregnant women there is a gap of 560 to 770 between requirements and the calories supplied by rations and the extra B.U.s allowed. Bransby and Magee propose that this gap can be closed by calories from 4 sources: (1) Unrationed foods, of which potatoes are the most important, other unrationed foods supplying not more than 200 calories per head per day. (2) Canteen and other meals taken "off the ration." (3) Exchange of points to B.U.s, since the average calorie value of points is less than that of the bread for which they can be exchanged. (4) The family pool. The third source could, at most, provide an extra 350 calories per head per day. But to change points to B.U.s involves the sacrifice of much of the little variety of diet that we can now expect. It would mean giving up baked beans, cereals (including all oat products), dried fruit, and sardines. In practice the exchange ran mainly in the opposite direction, so long as the exchange of B.U.s for points was allowed. It is unlikely that a family will change points to B.U.s on any scale so long as it can stave off hunger in any other way.

Between 50 and 60% of school-children are not able to get dinner at school; the possible number is limited by the lack of accommodation. Factories over a certain size must provide canteens, and some smaller factories also do so; but a large proportion of factory workers have no canteen; the number of British Restaurants has been limited by the difficulty of finding suitable buildings; adolescents may find it difficult to afford meals in canteens. Certainly less than half the school-children and manual workers obtain extra rationed food in the form of meals away from home; the rest must get from other sources any extra calories they need. Bransby and Magee suggest that owing to the extensive use of machinery for heavy work the average needs of manual workers may be lower than estimated; but it is just those workers who do heavy work with their own muscles who are the least likely to be able to get meals from canteens. We then have to consider how far the gap can be closed by unrationed foods, of which the most important are potatoes. Here Bransby and Magee seem out of touch with realities. The supply of potatoes for human consumption in 1943–4 was, according to *Food Consumption Levels*,[2] 255.8 lb. per head per year, or 5 lb. per week. According to the *Monthly Digest of Statistics* production has not risen by much since then. At present it is difficult to get the 5 lb. per head per week, and owing to the frost, the late spring, and flooding we may be short of potatoes not only until the new crop is raised but during the next potato year also. Yet the authors write of the consumption of 10½ lb. per week by adolescents, normal males, pregnant women, and miners, and of 14 lb. a week by other manual workers.

We are left then with the fourth source—the family pool. The average amounts of unrationed foods supply about 400 calories per head. With average consumption of these foods the gap, if no outside meals are eaten, ranges from 160 calories (pregnant women) to 370 (manual workers). On the other hand the rations of children of 1 to 5 years (about 5% of the population) supply some 500 more calories than the children need. The average requirements of men and women over 60 years old cannot exceed the 1,840 calories their rations supply. At ages between 5 and 10 rations are sufficient to meet requirements (1,900 per day) according to the scale used by Bransby and Magee. But Bransby and Wagner[3] found that children in this age group in Stockport and Stoke-on-Trent ate the equivalent of about 2,200 calories. There is no reason to suppose that these children were eating more than they needed; so children of this age group should not contribute to the family pool. School-children of 11 years and upwards also need both their rations and the average amount of unrationed foods in spite of their extra allowances of B.U.s.

The average number of calories taken by women in the middle class was, according to Widdowson and McCance[4] and Widdowson and Alington,[5] about 2,150 per day; so that rations and an average of unrationed foods would leave them about 100 calories to spare. But many of these women were in sedentary occupation; as a whole women probably need all the calories their rations and the average amount of unrationed foods supply. The only groups, therefore, whose requirements are exceeded by the calories supplied by their rations plus the average amount

[1] Med. Res. Cncl. Sp. Rep. Ser. No. 254, H.M.S.O., London.

[2] *Food Consumption Level in the U.S.A., Canada and the United Kingdom* 1944. H.M.S.O., London.

[3] *British Medical Journal*, 1945, **2**, 682.

[4] *J. Hyg.*, Camb., 1936, **36**, 13.

[5] *Lancet*, 1941, **2**, 361.

of unrationed foods are children up to 5 years and old people. This surplus would, if it were shared, provide those adolescents, normal males, and manual workers who do not get canteen meals, and make up some 17% of the population, with about 400 calories a day and would close the gap. But this distribution is not possible unless the adults, families with young children, and old people take considerably less than the average amounts of unrationed foods, instead of cutting down their purchases of bread.

However unsatisfactory it may be, the family pool is the solution that is adopted in practice. It is based on the principle of women and children last. On this principle the children of families studied in the surveys made during the depression of the early twenties got less than they needed for normal growth; in the lower income groups the pregnant women, whose diets were studied by McCance, Widdowson, and Verdoe-Roe,[6] received well under the 2,440 calories their present rations supply; although they were allowed a pint of milk a day by the local authorities the average amount they kept for themselves was only 1/4 pint.

Rationing of bread is an evil in a class apart from that of the rationing of other foods. Our diet may not be so dull as some would make out; but there are not sufficient amounts of appetizing foods nor sufficient variety to induce people to eat more than they need; the results of such surveys as have been published confirm this. Rationing of the main source of calories must reduce the intake below needs, unless the supply of other foods is increased, if it is to succeed in one of its objects—the restriction of the consumption of cereals. Another object of bread rationing was to check its use for feeding fowls. This could have been achieved as well or better by restricting the number of hens kept by domestic poultry keepers to the number for which the poultry keeper can obtain rations of balancer meal. As it is, the families that do not need all their rations of bread can give the surplus to their fowls; since the exchange of B.U.s to points was stopped they no longer have any incentive to refrain from doing so. To take oat products off points at this time of the year is to invite their use for feeding chicks.

It should not be necessary to speculate about the effects of bread rationing. The Ministry of Food has for years conducted a survey of the consumption of food by representative families throughout the country. But on the principle that "any material collected at the public expense by public servants for the public benefit should on no account be made public," the results are still treated as "confidential," and only a few details have leaked out. Oddly enough, Ministers of Food have preferred to quote estimates of the total amounts of foodstuffs "going into consumption" and the intake of nutrients based on these, when they have these more useful figures in their Department. It is little use to tell us that the supply per week of fresh and frozen meat is some 32,000 tons, or about 25 oz. per head, when we know by experience that the amounts we actually get are considerably less.

[6] *J. Hyg.*, Camb., 1938, **38**, 577.

VITAMIN C IN THE SPRING

The ascorbic acid in our diet is usually at its lowest in March. By then the amount in potatoes has fallen to a half or a quarter of the level in new potatoes, and green vegetables have become scarce. The supply of vitamin C rises slightly in April and May as more green vegetables appear, but does not reach high levels before the end of July. This year the vitamin C trough will be deeper and more prolonged, for potatoes are becoming scarce, and owing to the long cold winter green vegetables are very scarce and the spring vegetables will be late. In institutions where special care is taken over the supply and cooking of vegetables the average daily intake of vitamin C falls in ordinary years to about 20 mg. during March. Many people get less than 10 mg. a day. At present they may find it difficult to get even that, for half a pound of boiled potatoes eaten shortly after cooking will supply no more than 5 or 6 mg.[1]

Does this shortage matter? Can the population as a whole live without any impairment of health on 10 mg. or less of ascorbic acid a head for some two months, preceded by two months or so in which the supply was little higher? How much ascorbic acid do we need in order to maintain full health? Animals that make their own ascorbic acid have some 0.4–0.5 mg. of it in 100 ml. of plasma. The concentration in the plasma of guinea-pigs, which depend on their food for their ascorbic acid, rises to this level when they are getting the optimum amount for the healing of wounds. To reach such levels an adult human being needs about 50 mg. a day. The highest claims of benefit from such large intakes are those of Campbell and Cook,[2] who found much more rapid healing after extraction of teeth when large doses of ascorbic acid were given, and those of Hunt[3] and other surgeons for the improved healing of wounds. Conclusions about healing after extraction have been criticized on the ground that no allowance was made for the effect of the first extraction or the rate of healing after the second, and it is not certain that the control subjects of operations were strictly comparable. Several experiments with supplements of ascorbic acid provide little evidence of benefit. Bransby and colleagues[4] reported a slight reduction of the incidence of gingivitis but no other improvement among children taking 50 mg. of ascorbic acid a day, though many of the control children must have been getting under 10 mg. a day. Linghorne and his colleagues[5] have recently found that the frequency of gingivitis was less in groups of men who had 75–80 mg. of ascorbic acid a day than among those who had 22 mg.

The League of Nations adopted 30 mg. of vitamin C a day as a desirable daily intake. This figure was presumably based on the experiments of Göthlin,[6] who observed signs attributed to lack of ascorbic acid in individuals after some ten weeks of deprivation; they recovered when allowed 13 to 24 mg. per day. Since then Pijoan

[1] Olliver, M., *Chem. Ind.*, 1943, **62**, 146.
[2] *Brit. dental J.*, 1942, **72**, 213.
[3] *Brit. J. Surg.*, 1941, **28**, 436.
[4] *British Medical Journal*, 1946, **1**, 193.
[5] *Canad. med. Ass. J.*, 1946, **54**, 106.
[6] *Acta med. scand.*, 1937, **92**, 1.

and Lozner[7] have kept one person for fifteen months on a diet which supplied about 20 mg. a day; the concentration of ascorbic acid in the leucocyte layer of the blood remained steady, wounds healed, and health remained good, though the concentration in the plasma was near zero. When the intake was 10 mg. a day the concentration in the leucocyte layer fell, an indication that the body's stores of ascorbic acid were being used up. Johnson and his colleagues[8] found that young men can do strenuous work and keep in good health for two months without any ascorbic acid in their food. The Accessory Food Factors Committee of the Medical Research Council showed by experiment (the full results of which have not been published) that individuals could exist on a vitamin-C-free diet for a long time before showing signs of deficiency: and, moreover, amounts of vitamin C of the order of 10 mg. a day cleared these signs up.

Our outlook on this type of experiment may be changed by one of the results of an experiment conducted by the Accessory Food Factors Committee.[9] Two persons out of a group who were deprived of vitamin A for over a year were subsequently found to have tuberculosis. They had been examined before the experiment, and no signs of tuberculosis had been observed. The development of tuberculosis or activation of a quiescent focus may or may not have been a coincidence, but it will no longer be possible to start such experiments with the light-hearted assumption that any damage will be slight and reversible. The minor and obvious defects, such as impaired dark adaptation, may be cured by relatively small doses of the vitamin, but the more serious damage remains. Apart from this the results of experiments vary. In other observations by responsible workers on deficiency of vitamin A (for example, those of Booher and colleagues[10] and Steven[11]) dark adaptation has been impaired far sooner than in the experience of the Accessory Food Factors Committee. And the effects of experimental deficiency are different from those of spontaneous deficiency disease. In clinical scurvy the gums are swollen and bleeding and heal promptly on treatment with ascorbic acid; in experiments, such as that of Crandon,[12] the gums may remain healthy in a person who in other respects is in a very bad way. Vilter and colleagues[13] have recently drawn attention to the anaemia, curable with ascorbic acid, in cases of clinical scurvy; but anaemia is not observed in experimental deficiency. Again, the Accessory Food Factors Committee found follicular keratosis to be one of the early signs of such deficiency (quoted by Cuthbertson[14]); but in many cases of clinical scurvy that occur in England this skin condition is not seen. Both the amounts required and the response to deficiency seem to be influenced by factors we do not yet understand. It is possible that Göthlin's observations, in which one of the first signs, as in scurvy, was swelling and bleeding of the gums, give a better indication of the requirements of the population as a whole.

As the evidence stands at present we may well doubt whether daily intakes of 10 mg. of ascorbic acid are sufficient to maintain people in full health, particularly as Linghorne and his colleagues reported numerous complaints from officers that men on a low intake were longer on repair jobs than before, and that a number of them complained that they tired easily. It is essential, therefore, that we should make the fullest use of such sources of vitamin C as we have. Potatoes should not be mashed and should be eaten soon after they are cooked. There is little hope of persuading more than a few people to eat green vegetables raw, even if there were the greens to eat. Mustard and cress are more tempting, and one of the small boxes in which they are sold holds about 2½ oz., which contains about 50 mg. of ascorbic acid, the same amount as is contained in one orange. One box a week will supply ascorbic acid at the rate of 7 mg. a day. With such other vegetables that can be bought it should be possible to get nearly 20 mg. a day.

PENICILLIN DOSAGE

How penicillin can be administered parenterally with the least trouble consistent with efficiency has been a major problem from the earliest days of its therapeutic use. It was for some time assumed that the ideal to be aimed at was the continuous maintenance in the blood of an adequate therapeutic level—a concentration, that is, which would at least inhibit the growth of the micro-organism causing the infection. If this is to be achieved with economy frequent doses are necessary; the longer the interval between them the greater must be not only the individual dose but the total daily amount given. This policy, carried to its logical conclusion, demands continuous injection, and it is in fact only by the intravenous or intramuscular drip that an adequate blood level can be maintained by an expenditure of only 100,000 units daily. Nevertheless many patients in the early days received this amount of penicillin in the form of three-hourly injections, and although they can have had an adequate blood level only for part of each interval the treatment usually succeeded. We are now seeing the intermittent method in its turn carried to extremes, not of choice but by force of necessity in the circumstances of general practice. We are encouraged to believe that large doses injected only twice a day, or even larger only once a day, will achieve the effects required. Elsewhere in this issue Dr. D. P. Wheatley gives an account of 7 patients—4 of whom had boils or carbuncles, the others purulent conjunctivitis, a whitlow and a stye—6 of whom responded well to a single daily injection of penicillin in no case exceeding 200,000 units; the single patient who had this dose twice daily is said to have done no better than the rest.

It was suggested in the answer to a question to which this author refers in his opening sentence that a systematic study of the comparative effects of three-hourly and twelve-hourly penicillin administration might well be undertaken. We again commend this proposal to anyone in a position to undertake it. Only a controlled clinical trial on a considerable scale can establish the uses and limitations of "massive" penicillin dosage. It may be that too much importance has been attached to blood levels; that diffusion into the infected area, as demonstrated in wounds by M. E. Florey and her colleagues,[1] enables an effect to be exerted locally long after penicillin has disappeared from

[1] *Lancet*, 1946, **2**, 405.

[7] *Johns Hopk. Hosp. Bull.*, 1944, **75**, 303.
[8] *J. Nutrit.*, 1945, **29**, 155.
[9] *Nature*, Lond., 1945, **156**, 11.
[10] *J. Nutrit.*, 1939, **18**, 459.
[11] *Trans. Ophthal. Soc.*, 1942, **62**, 259.
[12] *New Engl. J. Med.*, 1940, **223**, 353.
[13] *J. Lab. clin. Med.*, 1946, **31**, 609.
[14] *Report on Newfoundland*, 1947. H.M.S.O., London.

the blood. If this is the explanation of the efficacy of large dosage at long intervals it may apply only to certain types of lesion and not to others, for reasons dependent on the rate of formation of the inflammatory exudate. In default of more exact knowledge it is probably advisable to treat more serious cases by three- or four-hourly injection wherever possible. From another point of view it might be said that frequent doses should always be given when this is possible, since they are certainly more economical; our present consumption of penicillin is enormous, and the exportable surplus might be much larger with advantage to the national economy. Possible alternative methods for the future, whereby a continuous effect may be maintained without frequent visits or the services of a nurse, are inhalation, oral administration, and injection in an oil base. All are extravagant methods: the last is the only one by which a single dose will give an effective blood level for twenty-four hours. Although this effect has been obtained in the U.S.A. by Romansky and Rittman[2] with a highly refined beeswax-peanut oil preparation, we know of no evidence that corresponding preparations available in this country will give so prolonged an effect.

LOUIS PASTEUR

The work of Louis Pasteur is at present being commemorated by an exhibition at the Science Museum, South Kensington. The greater part of the material has been transferred direct from the Palais de la Découverte at Paris, but there is in addition an exhibit by the Wellcome Historical Medical Museum, consisting largely of original manuscripts and apparatus of Pasteur. It is a good thing that the French Government has arranged this exhibition, since Pasteur is one of those men whose greatness in many fields can bear commemoration. The inaugural address to the Exhibition was given by Sir Alexander Fleming, and is printed in full in the opening pages of this week's *Journal*.

Of all the non-medical scientists who have enriched medicine Pasteur is probably the greatest. His outstanding characteristic was the ability with which he cut through the difficulties of a new subject, leaving it thereafter a new science. There was little in his early career to foreshadow such greatness. In an important examination in chemistry—his own subject—his paper was marked "mediocre," yet within a very few years he had differentiated between tartaric and paratartaric (racemic) acids, and shown that the optical differences between dextro- and laevo-rotatory tartaric acid crystals were correlated with minute physical differences in the crystals themselves. This work really laid the foundations of stereo-chemistry.

Perhaps the most lengthy of all Pasteur's investigations were those which he devoted to the subject of fermentation. He began these just after he went to Lille in 1854 as Dean of the Faculty of Science, and they were continued, with some intervals, until 1876, when his great work *Etudes sur la Bière* was published. Quite early Pasteur showed that if a solution of pure sugar containing ammonium phosphate and some chalk is allowed to stand, a gas is evolved, and lactic "yeast" settles at the bottom of the vessel. He thought that the ferment probably came from the air, since the reaction did not take place with heated air. He stoutly maintained that yeast is a living organism, and in doing so incurred the lasting hostility of Liebig. These lactic acid studies formed the foundation of all Pasteur's fermentation studies, and indeed of the science of bacteriology. They led to his important work on vinegar and the souring of wine, and finally on diseases of beer. It has been said that Pasteur was a practical worker rather than a theoretical scientist, and in all these subjects Pasteur's work led to marked improvements in the processes of manufacture or storage of the respective beverages.

These researches also gave Pasteur a method of filtering the air which was admitted to potentially putrescible liquids. They thus enabled him to enter the strictly bacteriological field in an attempt to disprove the theory of spontaneous generation. Almost at the start he carried out experiments which attained their end, and his *Mémoire sur les Corpuscules Organisés qui Existent dans l'Atmosphère* (1862) is a classic of science. Pasteur proved that air contained germs, but that it was possible to supply heated air to a boiled infusion without the latter being affected. However, if unheated air is subsequently introduced the infusion is infected. He further demonstrated that atmospheric air can be admitted to a putrescible medium without infection taking place, provided that the air enters through a long neck which is so bent as to trap the germs. These important results were extended almost at once by Tyndall, and Pasteur and Tyndall were jointly responsible for the final overthrow of the theory of spontaneous generation.

Despite the fact that Pasteur is the father of modern bacteriology, he and his followers discovered few new organisms. Pasteur's mind began working in the direction of prevention. His earliest practical application of his views was in connexion with a disease of silkworms (*pébrine*), and very soon he was absorbed in his experiments on the prevention of anthrax in animals. His work on chicken cholera led to his methods of attenuating organisms for injection (1880), and on this foundation rests the modern science of immunology. His final and greatest effort in this field was his research on rabies, a disease which appealed greatly to the popular imagination.

During his lifetime the Royal Society twice honoured Pasteur. In 1856 he was awarded the Rumford Medal, and at a later date the Society gave him its highest honour—the Copley Medal. His own country has honoured him by the foundation, among other institutions, of the Institut Pasteur and its many branches. As Bulloch said, "There is no department of bacteriology that he did not enrich by his genius."

OCCUPIED HOLLAND

Holland is one of the most thickly populated countries in the world, and about one-fifth of its area lies below sea-level. Most of its people live in the three small industrialized provinces of Utrecht, North Holland, and South Holland. Before the war the health services were of an excellence appropriate to the high standard of living enjoyed by the Dutch—a way of life that was nevertheless precarious, depending as it did on a complex drainage system and trade with a great overseas empire.

The withdrawal in September, 1944, of the remnants of the First Airborne Division across the Lower Rhine, while for us merely postponing the possibility of victory over the Germans until the following year, was a major disaster for the whole Dutch nation. Starvation fell upon the land, afflicting especially the inhabitants of the cities and larger towns, and was accompanied by those diseases that flourish in an underfed, cold, overcrowded, and ill-housed population. The Chief Medical Officer of Public Health in the Netherlands, Dr. C. Banning, elsewhere in this issue (p. 539) explains what this meant in terms of death and disease. The rapid spread of tuberculosis, acute poliomyelitis, and typhoid fever was something which could have been predicted. Quite unpredictable was the rapid increase in the number of cases of diphtheria—50 times the 1939 figure—and also the relatively high number of adults affected.

[2] *New Engl. J. Med.*, 1945, **233**, 577.

Dr. Henriette A. Lohr (p. 540) describes the effects of starvation and malnutrition. Her findings correspond closely with those of other observers in this field.

Conditions were at their worst during February and March of 1945, and were aggravated by an unusually cold spell of weather which froze many of the canals. The official ration was reduced to 340 calories a day, but many were too weak to stir out of doors to collect even this. In the three industrial provinces, the so-called B2 area or western district, 15,000 people died of hunger, and 80,000 cases of hunger oedema were known. First the Swedish Red Cross, and later airborne supplies from Britain, provided a certain amount of food, but lack of internal transport rendered distribution difficult. In contrast to this tale of disaster Dr. J. G. G. Borst (*Supplement*, p. 57), the professor of medicine at Amsterdam University, shows how a well-organized and united medical profession was able to thwart the dictates of their German oppressors. In the main it was by means of passive resistance, since active resistance by the medical profession as a whole can result only in harm to their patients. Dr. Borst writes that "the medical profession was also the only section of the population which unflinchingly and successfully resisted the encroachments of the Compulsory Labour Service." For many this meant the added discomforts of going into hiding—"under water," as they called it—and, for others, terms of imprisonment. Dutch doctors also played an active part in the resistance movement. Many wounded soldiers and airmen stranded in occupied Holland owe their lives and subsequent freedom to the skill and courage of the doctors and nurses. Because of their professional duties they were allowed greater freedom of movement than most civilians, and they made excellent liaison officers between various sections of the resistance movement.

Like us, the Dutch are suffering from a shortage of hospital accommodation and, to an even greater extent, from lack of trained nursing staff. However, they are hard-working people, and they are rapidly rebuilding their homes; their standard of living is now well above ours, and the flooded fields are again under the plough. Wooden huts have been ordered from Sweden to provide sanatoria for the many cases of tuberculosis resulting from the war. Those who were privileged to be with the Dutch behind the German lines during the winter of 1944–5 felt nothing but admiration for them. Doctors and nurses short of food and medical supplies spared themselves no pains for the sake of their patients. In spite of all difficulties they retained their professional integrity.

CUTANEOUS DIPHTHERIA AND THE HEART

Absorption of diphtheria toxin from the usual site of infection—namely, the tonsillo-pharyngeal area—gives rise to myocarditis in a proportion of cases which may vary from 10 to 25%. Thus in 1922 Schwensen[1] recorded a rate of 17% in a series of 568 cases; 118 were classified as "severe," and there were 8 deaths. At the Herman Keefer Hospital, according to Top,[2] 21% of 1,828 cases were affected. Such an incidence includes both the early manifestations such as heart block, which is often fatal, and the late disturbances of rhythm from which death is less usual. Burkhardt, Eggleston, and Smith,[3] who analysed the results of clinical and electrocardiographic studies in 140 patients with diphtheria, divided their cases of myocarditis into two groups. A first group of 23 patients showed mainly alterations in the S-T wave and lowered amplitude of the T wave. These changes occurred on an average 15 days from the onset of the disease with a range of 5 to 39 days. The second group of 17 patients showed conduction defects which were noted earlier—on an average 8 days after onset with a range of 5 to 13 days. An interesting finding was that the latter changes took place in a much younger group of patients than the former. Most of the patients who developed signs of myocarditis also showed signs of some form of nervous lesion. Alstead[4] recorded somewhat similar changes and in a later paper[5] suggested that a negative or isoelectric T-wave might in recovered cases persist for many years.

When diphtheria toxin is absorbed from the skin the picture presented is not so clear. Although most cases are diagnosed late and many have peripheral nerve lesions, a much smaller proportion develop myocarditis. Kay and Livingood[6] have recently analysed a series of 140 cases of cutaneous diphtheria in the India–Burma theatre of war. The bacteriological diagnosis was not entirely satisfactory under field conditions, but judged by the extent of the local ulceration there were 50 mild, 72 moderate, and 18 severe cases, with only one death. Myocarditis developed in 4 of the severe, in 3 of the moderate, and in none of the mild cases. Electrocardiographic studies were made repeatedly, and the most frequent abnormality was depression or inversion of the T wave—a change which appeared usually between the fourth and seventh weeks; 4 of these patients had peripheral nerve damage. Such findings run parallel to those of Cameron and Muir,[7] who in 66 cases found paralysis in 12 but made little comment on cardiovascular changes beyond noting that the only fatality was due to circulatory failure. Myocarditis would thus seem less frequent, less severe, and rather later in appearance in the course of cutaneous diphtheria. That severe circulatory failure occurs is undoubted; indeed it was the sudden death of one of their early patients which aroused Kay and Livingood's interest in the subject.

The inclusion of many mild infections in the records of cutaneous diphtheria might in part explain this difference. Once the condition is kept in mind the diagnosis may become common in the Tropics, for skin sores abound and bacteriological examination often yields positive results even in quite atypical lesions. Clarkson[8] found diphtheria bacilli in 20 out of 30 infected wounds, but although 2 cases developed peripheral neuritis he did not seem to regard the infection with undue alarm. Chronic wounds particularly showed a high incidence of *C. diphtheriae*. It is a pity that such cases arise in appreciable numbers only under conditions which preclude examination of the patient's immune status; even the results of Schick-testing would be valuable in their assessment. But this cannot be the sole explanation, for in the series analysed by Kay and Livingood 43.5% of the cases developed a nerve lesion. The other reason may lie in the fact that diphtheria toxin is carried more rapidly and easily to the medullary nuclei from faucial lesions and that in cutaneous diphtheria these centres are, therefore, to some extent spared, with a consequent reduction in late circulatory defects. Despite extensive work on the cardiac complications of diphtheria there is still need for further study to elucidate the relative importance of peripheral and central damage in its pathogenesis.

We announce with regret the death of Dr. C. Louis Leipoldt, formerly Editor of the *South African Medical Journal* and Medical Secretary of the Medical Association of South Africa.

[1] *J. infect. Dis.*, 1922, **30**, 279, 308.
[2] *Handbook of Communicable Diseases*, 1941, Mosley, St. Louis.
[3] *Amer. J. med. Sci.*, 1938, **195**, 301.
[4] *Quart. J. Med.*, 1932, n.s., **1**, 277.
[5] *Lancet*, 1933, **1**, 413.
[6] *Amer. Heart J.*, 1946, **31**, 744.
[7] *Lancet*, 1942, **2**, 720.
[8] Ibid., 1944, **2**, 395.

OCCUPIED HOLLAND

I. THE PUBLIC HEALTH

BY

C. BANNING, M.D.

Chief Medical Officer of Public Health in the Netherlands

Before the war Holland ranked among the highest of nations regarding health. The death rate of babies was extraordinarily low. During the war the mortality rate increased regularly without, however, the "summer top" feared so much in former times. Immediately after the liberation, in the summer of 1945, in spite of the good food supply the death rate of babies was so high that we could again speak of a "summer top." Many babies died within a few days with toxic appearances for which we could find no definite cause. Necropsy revealed no obvious reasons for the deaths. Per 1,000 born alive there died in the whole kingdom:

	Under 1 Week	1 Week to 1 Month	1 Month to 1 Year	Total
1939	15·5	4·3	13·9	33·7
1940	16·0	5·3	17·9	39·1
1941	16·5	6·2	20·9	43·4
1942	14·5	4·4	18·5	39·8
1943	14·2	6·3	19·8	40·3
1944 (1st half-year) ..	15·5	7·4	20·7	43·5

As regards infectious diseases Holland could be proud of its abnormally small number of cases. During the war *diphtheria* spread in a startling manner, and it was observed that the higher age groups were gradually being affected in large numbers. The epidemic started in 1942, in the southern provinces, and in the course of the next year or two spread over the whole country. In spite of the high figures recorded the number of cases is believed to have been still higher; for owing to poor communications many doctors were unable to report all the cases to the Inspector of Public Health.

Besides the steep rise in diphtheria there was an abnormal increase in the number of cases of *typhoid fever*. Already, in 1942 and 1943, cases were nearly five times as numerous as in pre-war years; but in the first six months of 1945 the rise was still more startling. How could it be otherwise? Families were herded together under extremely bad hygienic conditions. Thousands of houses and many water-pipes had been destroyed; medicines, disinfectants, and coal were scarce; and there was a total lack of soap. Fortunately the number of cases of typhoid is now declining. *Scarlet fever* also showed a rise, but not to the same degree as diphtheria and typhoid.

	Reported Cases of Illness				Reported Deaths			
	Diphtheria	Scarlet Fever	Typhoid Fever	Acute Poliomyelitis	Diphtheria	Scarlet Fever	Typhoid Fever	Acute Poliomyelitis
1939 ..	1,273	10,257	172	403	75	24	25	25
1940 ..	1,730	8,841	108	111	103	34	21	13
1941 ..	5,437	7,197	161	445	213	35	27	22
1942 ..	19,407	12,694	521	196	873	23	50	20
1943 ..	56,790	28,566	531	1,931	2,515	128	76	222
1944 ..	60,226	22,470	472	1,180	?	?	?	?
1945* ..	49,730	4,788	4,848	190	?	?	?	?

* Provisional figures.

Tuberculosis

Tuberculosis causes much concern. All our strength will have to be exerted to combat this illness. The following table shows the rise of the total death rate of tuberculosis, as well as the death rate per 10,000 inhabitants and the increase per cent over 1939.

	Total Deaths from Tb.	Deaths per 10,000 Inhabitants from Tb.	Increase over 1939 (%)
1939	3,604	4·10	—
1940	3,881	4·37	6·6
1941	5,305	5·92	44·4
1942	5,555	6·13	50·0
1943	6,357	6·99	70·5
1944 (1st half-year)	3,789	8·38*	102·0*

* Calculated on death rate per annum.

The fight against tuberculosis in Holland is carried on in Tuberculosis Consultation Bureaux. Holland is divided into districts, each having a consultation bureau with branch consultation bureaux in the smaller places, and it is possible for every citizen to visit them. Admission to the bureaux is free for everybody, from the poorest to the richest. The work of the consultation bureaux is to detect contact cases. The rise in tuberculosis can be noted not only from the mortality rate but from the increased number of cases which visit the consultation bureaux. In 1939 the new registrants were 60,377, in 1942 122,795, in 1943 157,844. In 1939 the consultation bureaux reported 13,560 cases of tuberculosis, in 1942 24,622, and in 1943 27,981.

A recent investigation of the bureaux showed that 50,000 cases of tuberculosis are known in the Netherlands. Thousands have to wait for months for admission to a sanatorium. All the sanatoria are filled to capacity, and it will take years to reach the favourable pre-war standard. Sanatorium and hospital facilities are being increased by providing wooden barracks, 300 of these having been ordered in Sweden. Every barrack will house 18 patients. Our greatest trouble is not lack of equipment but lack of medical and nursing personnel.

A Period of Malnutrition and Starvation

Malnutrition did not appear over the whole of Holland but only in the so-called B2 area or western district (the provinces of Utrecht, North Holland, and South Holland). In these provinces live half the population of the Netherlands—namely, 4 to 5 millions. The big cities—Utrecht, Amsterdam, Haarlem, Leiden, The Hague, and Rotterdam—are situated in the B2 area. When the Allied Forces marched into Nijmegen and Arnhem (September, 1944) and our Government in London ordered a universal railway strike the whole railway personnel obeyed: the Germans closed our non-agricultural provinces from the agricultural northern and eastern provinces as a reprisal. Seyss-Inquart laid an embargo on all the provisions which were transported from the north and east to the west, in order to maintain our already small rations. By this closing, and also because the Germans took away every means of transport, the western district was doomed to hunger.

The reserve of provisions in the western district was in such a state that the disaster already foreseen became a reality. The winter of 1944–5 was the winter of the notorious "hunger journeys." Officially no provisions were allowed to be transported, but it was often possible for people to break through the German line towards the north and the east. In that cold winter thousands of girls and women, on bicycles without tyres or with a hand-cart, etc., badly dressed, with poor footwear, and starving, went in search of food. Journeys of 100 to 200 miles (160 to 320 km.) were no exception. They came home laden with 30 to 50 kg. of potatoes and some wheat, and could live for a few more weeks on that. Men between 16 and 50 years of age did not dare to show themselves in the street as they were constantly being rounded up and deported to Germany; consequently our women and girls had to carry out this almost superhuman task.

During the winter the population of this B2 area lived without light, gas, heat, laundries, soap, or enough clothing, blankets, and food. Tulip bulbs and sugar-beet (officially distributed), plus some bread of very poor quality, were all we had to live on. After October, 1944, butter and animal fats were no longer distributed. As for other fats, from September, 1944, to the end of March, 1945—7 months—1.3 litres of oil was distributed per head, which means less than 0.2 litre per month. Officially there was also 100 g. of cheese per month, but often meat coupons were of no value because no meat was available. The bread ration gradually decreased. In the course of the war it had come down from 2,200 to 1,800 g. a week, then to 1,400 g., and later to 1,000 g.; in November, 1944, it was 800 g., and in April, 1945, 400 g. a week. Potatoes were rationed at 1 kg. a week, but were hard to get.

As for the number of calories that were officially available per person, I submit the following figures:

In the last week of	Oct.,	1944	about 1,300	cal. per day
" "	Nov.,	1944	" 900	"
" "	Dec.,	1944	" 550	"
" "	Jan.,	1945	" 460	"
" "	Feb.,	1945	" 340	"

Owing to the close co-operation of the Catholic and Protestant Churches the so-called "latent" supplies present in the B2 area could be mobilized, and because of this activity many thousands of Dutchmen were able to hold on a little longer until, in the course of the first quarter of 1945, the Swedish Red Cross brought some relief. The number of calories could then be increased to 525, and it was possible to distribute a food parcel of 700 calories a day for some weeks. But the last weeks of April, 1945, brought a severe cut—viz., to 400 calories a day. During the week before the liberation there was nothing left in the western district. Just for a few days a distribution of 230 calories a day, and then—no more. And in the very depth of this misery came the "finest dropping of the war," and Allied bombers threw out manna from Heaven. The "German" ration of 230 calories a day during the last days of April, 1945, was changed into the weekly "Allied" ration of:

800 g. bread	125 g. meat	½ tin bacon
900 g. biscuits	100 g. cheese	2 bars of chocolate
200 g. fat	200 g. beans and peas	1 kg. potatoes
100 g. butter	200 g. sugar	1 litre milk

Consequences of the "Hunger Rationing"

The first cases of death as a consequence of hunger were officially registered in the beginning of January, 1945. The death rate from hunger increased rapidly each week. Altogether at least 15,000 people died of hunger in B2 area, while about 80,000 cases of hunger oedema were known. First I will give a survey of the general death rate in the four big cities of the western district in the first half of 1939, 1944, and 1945.

Community	General Death Rate 1st Half-year			Ratio (1939 = 100)			Death Rate per 1,000 Inhabitants		
	1939	1944	1945	1939	1944	1945	1939	1944	1945
Amsterdam	3,655	4,399	9,735	100	120·2	266·3	4·60	5·69	12·61
Rotterdam	2,616	3,260	7,827	100	124·6	299·2	4·25	5·39	12·94
The Hague	2,419	2,940	6,458	100	121·5	267·0	4·86	6·50	14·38
Utrecht	776	1,112	2,065	100	143·2	266·1	4·67	6·54	12·15

The death rate was greatest in February and March, when food rations were smallest. In the smaller towns the death rate increased in almost the same ratio as in the big cities, while the rate in the country districts, although increasing, was not so serious as in the towns. It is remarkable that in the big cities the death rate of men was much higher than the death rate of women. It is not clear to what causes the higher death rate among men was due. Heavier work was not a likely cause, for many factories and offices were either forced to a standstill or had to carry on with a greatly decreased working time. The women did wonders in the way of physical effort: it was they who went out for food under the most unfavourable conditions. Moreover the high male death rate occurred in all age groups, including infants and the groups over 50 years. As hundreds of thousands of men had already been deported to Germany, and others had "gone underground"—i.e., they hid somewhere in the country—the death rate for men might have been still more unfavourable. It is now known that 75% of those who died from malnutrition were men.

Death Rate from Malnutrition in The Hague in 1945

Age Group	Total Death Rate			% of Dead from Malnutrition		
	1st Quarter, 1945	2nd Quarter, 1945	Half-year, 1945	1st Quarter, 1945	2nd Quarter, 1945	Half-year, 1945
Under 1 year	28	24	52	2·12	3·09	2·48
1– 4 years	14	11	25	1·06	1·41	1·19
5– 9 "	5	0	5	0·38	—	0·24
10–14 "	0	2	2	—	0·26	0·10
15–19 "	3	1	4	0·23	0·13	0·19
20–24 "	10	4	14	0·76	0·51	0·67
25–29 "	12	7	19	0·91	0·90	0·90
30–34 "	13	9	22	0·98	1·16	1·05
35–39 "	16	10	26	1·21	1·28	1·24
40–44 "	43	20	63	3·26	2·57	3·00
45–49 "	62	29	91	4·70	3·74	4·35
50–54 "	90	36	126	6·83	4·63	6·01
55–59 "	153	62	215	11·60	8·00	10·26
60–64 "	154	93	247	11·67	12·00	11·80
65–79 "	586	373	961	44·43	48·32	45·87
Over 80 years	130	93	223	9·86	12·00	10·65
Total	1,319	776	2,095	100%	100%	100%

What strikes one when examining the death rate from malnutrition is the fact that persons in the older age groups were those mostly affected. This is exemplified in the figures for The Hague given in the preceding table. Consequently in The Hague as many as 84% of the deaths due to malnutrition were of persons over 50 years, while 56% were of those over 65. In the age group 5–35 years there were very few deaths—in The Hague only 3.14% of the total. The growing-up period of 5–19 years came out exceedingly well, whereas the percentage for the infants was fairly high. I dare not say to what degree the combination of hunger plus cold played its part in this trouble. Though I give only the figures for The Hague, those for the other big cities in the western district (Rotterdam, Amsterdam, Haarlem, Leiden, Utrecht) show exactly the same picture. The western district paid heavily for this war, suffering as it did from so severe a famine.

Relief Measures

And now for the question how we combated the hunger. On May 3, 1945, some days before the German Headquarters capitulated, consequently when the war was still going on in B2 area, four Allied officers entered that area. It was the "Advisory Committee" for the "Special Feeding Teams," who were ready in the southern part of our country to help B2 in its great need. The leader of this "Advisory Committee" was Sir Jack Drummond (England); the others were Dr. Leach (U.S.A.), Dr. Beattie (England), and Dr. Loutit (England), together with myself. The 50 special feeding teams (each of them with a doctor as its leader) were distributed over the most threatened places in B2. Their activities started in the hospitals; later on they shifted to the polyclinics. The teams brought specially prepared food, together with laboratories and instruments. At the same time large quantities of food were dropped on the aerodromes and loaded ships came up "Waterweg" to Rotterdam, while from the east via the province of Gelderland, thousands and thousands of tons were brought by trucks. The result of all this was that by May 15 there was a considerable decrease in the number of deaths from malnutrition—a decrease which continued till the beginning of August, when it disappeared altogether.

II. CLINICAL IMPRESSIONS*

BY

DR. HENRIETTE A. LOHR

Amsterdam

Whereas in Paris hunger osteopathy was seen as early as 1942, the first case of osteomalacia caused by food deficiency in Holland was described in March, 1943. Afterwards there were many cases of hunger osteopathy.

The chief symptoms in hunger osteopathy are pain and stiffness of the back, the lower limbs, the feet, and now and again also in the arms and ribs. The patients move about in a curious stiff way, and when rising out of a chair have to heave themselves up by their hands. Coughing and sneezing may be painful. In some cases, as the complaint was thought to be of rheumatic origin, gold therapy had been tried, but in vain. On *x*-ray investigation one finds translucent notches or bands of decreased opacity, so-called looser zones, where the bone has been replaced by osteoid. They are located chiefly in regions of stress and strain. In some cases there are definite fractures with callus formation. Hunger osteopathy is regarded by certain authors as "the result of a combined deficiency of multiple food factors, of which animal protein might be one and of which vitamin D is probably the most important. If untreated, hunger osteopathy develops progressively into typical osteomalacia. Twenty-two of our cases occurred in women. We are inclined to ascribe this peculiar sex distribution to a difference in food habits between men and women, rather than to hormonal distinction between the sexes. Generalized osteoporosis is often present, but may be slight in early cases. All our cases improved with rest in bed, a full diet especially rich in animal protein and calcium (milk), with extra vitamin D by mouth or by injection. The patients lost their pains within two weeks. *X*-ray examination demonstrated objective improvement within two months. It is our impression that vitamin D

* Abridged from an address to the London Association of the Medical Women's Federation, Sept. 24, 1946.

was the most important therapeutic agent. It made no difference whether the vitamin was given by mouth or by injection."

From 1944 children were seen with Barlow's disease, which had become unknown in Holland, and rickets was increasing rapidly. Pellagra was observed in psychiatric patients from 1941, and afterwards cases occurred in mental hospitals, though they were fewer than had been anticipated. There were, however, many cases of perniosis, which probably had some connexion with nicotinic acid deficiency, and mouth and tongue sores, which undoubtedly had. The same can be said of beriberi: we did not see many definite cases, but there was an unusual number of patients with polyneuritis, and there still is. From 1942 we all had polyuria, especially at night, quite frequently amounting to more than 3 litres a day. It must be considered as a latent oedema.

Food poisoning by mushrooms and by beech-nuts was seen from 1942. Up to 1943 there had been 223 cases of the latter. Beech-nut poisoning is characterized by intestinal troubles, severe headache, difficulty in breathing, a cloudy effect on the brain, and in some cases a rabies-like condition: it can be avoided by removing the germ of the nuts. The illness passes in a few days and is never dangerous. Botulism brought about a state resembling myasthenia gravis.

Partly as a result of the coarseness of the food and partly owing to psychic strain, cases of ulcer of the stomach and of the duodenum increased. Stolte and Beaumont state that at the Onze Lieve Vrouwe Gasthuis at Amsterdam during the 44 months from January, 1936, to September, 1939, there were 392 ulcer cases in the wards, whereas during the 46 months from September, 1939, to July, 1943, there were 633. The number of ulcers of the lesser curvature was relatively higher than before the war and the perforations had increased considerably.

Treatment of diabetes mellitus became very difficult on account of the lack of insulin and of suitable food. All diabetics except the very severe cases had to do without insulin and had to be reduced to hunger diets. During the "hunger winter" these were symptom-free, though sugar-beet was their principal food. Afterwards they suffered severe relapses. Lack of fuel during the very cold winters of 1941 to 1944 was the cause of a much higher incidence of rheumatic diseases and perhaps also of nephritis. The latter, however, was apparently contagious, like trench nephritis during the war of 1914–18. It was characterized by severe uraemia and oedema, with a blood pressure that was only moderately high. Blood pressure in general had a tendency to be lower than usual, probably because of undernourishment.

Poliomyelitis and Diphtheria

During 1943 there was a bad epidemic of poliomyelitis and its contagiousness was clearly demonstrated in a home for children. Most of our bacteriologists now adhere to the theory of faecal infection. Lack of soap may have influenced this epidemic. We always have had some cases, mostly during the summer months: in Amsterdam they amounted to 8 or 9 a year. During 1943 in Amsterdam alone 635 cases were notified, and there probably were many more, as the abortive form with intestinal trouble, headache, and moderate temperature is not easily recognized and cannot be detected from the specific reactions in the spinal fluid, as during an epidemic these reactions are positive in many who haven't been manifestly ill. These persons must all have undergone infection and gained immunity as a consequence. In the course of one year the population may be said to be "durchseucht," as the Germans call it. To be sure, in the next year there were only 51 new cases.

Already in 1941 the figures for diphtheria were showing a tendency to rise. In Amsterdam new cases were shown to belong to the *intermedius* and not to the local *mitis* strain. The next year brought a very bad epidemic, and this time it was caused by the *gravis* strain, which had been imported from Germany. From a mean figure of 100 cases a year in Amsterdam, we had nearly 8,000 cases in 1944, among which were many severe infections, with early death from toxaemia or paralysis even after many months. The infection, moreover, was made worse by the lack of serum and could not be controlled until after our liberation, when we were able to obtain the potent new British sera. During this epidemic many adults fell ill, even those who had had diphtheria before, as the former *mitis* infection gave no protection against this new strain. This epidemic therefore proved fatal to many adult people as well as children.

Hunger Oedema

The official report of the percentage of people with hunger oedema during the spring of 1945 has not yet been published. Most of the population were showing some slight degree of oedema, and all of us had nocturia. In many people the oedema did not become manifest until the summer, when we had salt again. The oedema still has a tendency to return, perhaps because our food is poor in protein. Though there is a predilection for the lower parts of the body, other parts may become involved through various causes—for instance, local infection or mechanical irritation. A very frequent location was the face. In oedema formation the protein content of the blood plasma is not the only factor, for in some cases of oedema the blood protein was not lowered at all. Prof. Formyne is of the opinion that hunger oedema has some features in common with nephritic oedema as regards distribution, the possible normality of blood proteins, and the lack of a rise in venous pressure.

With regard to the last feature, however, Stolte has pointed out that the tissue pressure is very much lowered as a consequence of the loss of fat and part of the muscle tissue. There is a curious contrast between the dry leathery skin in some parts, which is loose and can be lifted up in big folds, and the solid oedema in other parts. Venous pressure cannot be high with such a low tissue pressure. In another respect there is a difference between the nephritic oedema and hunger oedema, as the latter is low in protein. Renal function was normal and there were no indications of cardiac insufficiency. Most people had a very pronounced bradycardia and lowered blood pressure. Damage to the capillary wall must be an important factor, as the Rumpel-Leede phenomenon was always present. Low tissue pressure is another factor, and lowering of blood albumin plays a part in some cases.

Dr. Adelsberger, from her experiences in German camps, made a distinction between two types of starvation—a dry form and one with oedema. We had the same experience in Holland, inasmuch as between February and May, 1945, people collapsed in the streets and died from starvation, with very low body temperatures, showing little or no oedema, and sometimes not seeming so very thin either, the latent oedema having taken the place of the intertissue fat. During this cold winter body temperatures of 27–29° C. were not uncommon in these people and most of them died. It proved very difficult to raise these low temperatures. After our liberation the number of patients with manifest oedema increased considerably. Even with a very poor diet and rest they would sometimes lose their oedema in a short time, showing a diuresis of 3–5 litres a day. All of these patients had anaemia, sometimes in a macrocytic form, which was not cured either by iron or by liver. It was not the deficiency anaemia of Lucy Wills, but rather an aplastic form, the bone marrow showing very little activity. It responded to proper feeding very slowly, and then often changed into a hypochromic anaemia, which reacted to iron.

Psychic factors were an extreme lassitude and apathy, with considerable irritability. Anxiety states and psychosis were sometimes seen. Many elderly people took to their beds and died because they could not be bothered with the trouble of standing in queues to get a pint of thin soup. Others were frozen to death from lack of fuel. The Bureau of Churches has done much good work in seeking out and feeding these people.

Polyneuritis was and is still a common disease. In some rare instances there was a neuritis of the optic nerve with central blindness, weakness of the muscles, considerable muscle irritability, and a tendency to cramps, which persists in some. The blood calcium was lowered in many instances. Chvostek's sign and Trousseau's phenomenon were only occasionally present.

Many people had intestinal troubles, which were aggravated by the diet of sugar-beet and tulips. For some time we had half a loaf of bread and 4 kg. of potatoes for the whole week

and nothing more, these rations amounting to 300 calories a day. Though people went far afield to get food, they often returned with little or nothing, and were weakened by days of walking or cycling.

People who collapsed, standing in queues or going about the little work that was yet done, did not show orthostatic hypotension, but a low blood sugar. They swayed some time before actually falling down, sweated, and seemed completely dazed. In extreme cases of starvation hunger disappeared and food was refused because of difficulties in swallowing. In elderly persons death from cold was caused by lack of fuel, but at the same time there may have been a deficiency of the thyroid gland as a result of starvation, as at necropsy the gland was found to be small and leathery. Basal metabolism was lowered in most people from 20 to 30%. Strange as it may seem during a period of hunger, in cases of hypothermia some advocated the use of thyroid.

A curious feature was that some girls and young women got fat on a diet totally insufficient. This condition is probably a mixture of myxoedema and hunger oedema, but the oedema is not demonstrated very easily. It is difficult to cure this condition with our present food supply. Even now there is a serious lack of protein and a relative abundance of carbohydrates. These patients are not benefited very much by thyroid extract. They complain of weakness and severe headaches, which sometimes are made worse by thyroid therapy. Treatment of starvation with or without oedema has consisted in rest in bed and a diet of skimmed milk with glucose and vitamins. Very slowly the food intake has been raised. Kaolin, lactic acid, charcoal, and opium proved of value in the treatment of intestinal trouble. Intravenous therapy of casein preparations, amino-acids, and blood or plasma transfusions did not prove of much value.

We have learned some things during this hunger period. Even those who didn't get oedema have experienced a curious change in their outlook and behaviour, which varied from complacency and apathy to irritability. Formerly we may have scoffed at the poor for not being able to grasp the many opportunities which life offers to better their conditions. We never realized the fundamental significance of food. People who have been starved many times, like the Indians, are apt to have an outlook on life and a standard of behaviour different from those of more fortunate ones. There is to-day nothing perhaps of more importance than the effort to obtain food control for the whole world, and nothing more necessary than to improve upon it until it is possible to provide adequate food for all countries and for every man and woman and child of the community. Not until this is achieved will it be possible to assess the intellectual and moral qualities of the various races, or to expect their willing and active co-operation towards pacification and unification of the world.

THE PASTEUR EXHIBITION

The United Nations Educational, Scientific, and Cultural Organization (Unesco) organized last year, as part of its International Month, an exhibition commemorating Pasteur, which was shown at the Palais de la Découverte in Paris. This has now, through the co-operation of the Cultural Relations Department of the French Foreign Office and our Ministry of Works, been brought to the Science Museum, South Kensington, where it will be on view free until May 26. It was opened on April 9 by M. Réné Varin, the Cultural Counsellor to the French Embassy in London, who said that perhaps Pasteur's most striking quality was his patience, which exemplified the aphorism that genius is a capacity for taking infinite pains. Throughout his life he had never set himself a plan of research but had let problems come to him. The work which had first made him famous has led to his revolutionary discoveries on the nature of fermentation, by which he had disproved the traditional notion of spontaneous generation. From that he had passed to diseases of silkworms, anthrax, fowl cholera, swine fever, and rabies. His love of science and humanity was entirely altruistic. He was completely indifferent to the standing of the persons he helped, and although he had had many opportunities of self-enrichment he had neglected them. He was an intensely religious man and spent the night awake and at prayer before he first used his antirabic serum on a human patient.

France was naturally proud of Pasteur, the more so because his qualities of tenacity and patience were relatively rare among Frenchmen. These very qualities had perhaps served to link him more closely with his English hosts, for whom he had performed some of his most notable work. Visitors would see an admirably penned letter in French from Lord Lister to Pasteur, and another in which Pasteur acknowledged the inspiration he had received from the works of Lister and Jenner. The intimate connexion of these three great men, in their will to help humanity, was a strong tie between their two countries.

Sir Henry Dale regretted that His Excellency the French Ambassador, M. Massigli, could not be present, but thanked him, M. Varin and his colleagues, and M. André Léveillé, Director of the Palais de la Découverte, who was directing the temporary installation of the exhibition in London. Dr. H. Shaw, the director of the Science Museum, had co-operated in arranging for this display, to the great gain in instruction and interest of all who visited it. An important addition had been made by the loan of a collection from the Wellcome Historical Medical Museum, and by the specimens lent by the Dewar Laboratory at Edinburgh and Messrs. Whitbread. The exhibition gave visitors the opportunity and privilege of recalling vividly, with intimacy and detail, the life and scientific achievement of one of the greatest of all the distinguished sons of France and one of the outstanding figures in the science of all the world in all the four centuries since modern science had begun. No adequate estimate could be made of the value in human health, happiness, and prosperity of all Pasteur's discoveries. His marvellously consistent career, which the exhibition served to teach and reinforce, pointed, however, one lesson: Pasteur did not set out on his life's work with even a thought that it would lead to discoveries revealing the nature of fermentation, of putrefaction, or, eventually, of infectious diseases as due to specific living micro-organisms; he did not even start as a biologist, but as a mineralogist and crystallographer. His first great discovery, which at the early age of 34 had won for him the Rumford Medal of the Royal Society, had been of the crystallographic and optical asymmetry of the two kinds of tartaric acid. From that discovery he had followed the natural lead of his genius, to recognize the connexion between such asymmetry and the chemical activities associated with life. Thus in logical and unbroken sequences he had come to discover living organisms as the causes of fermentation, putrefaction, and infectious diseases, to expose the fallacies in all the appearances which had led men to believe in spontaneous generation, and to lay the scientific foundations of all our knowledge of specific immunity. These discoveries had led to revolutionary changes in the conditions of civilized existence and represented an almost incredible sum of achievement for one man's life; but they represented the achievement of one who throughout his life remained a single-minded seeker for truth for its own beauty and interest, who had humbly accepted Nature's answer to his inspiring questions and faithfully followed the clue wherever it led.

Sir Henry concluded by saying he hoped the exhibition would strengthen still further the ties of intellectual and cultural sympathy and of scientific comradeship between France and Britain, and that, as in Pasteur's day, so now the work of scientists would help both peoples to rise above the losses, injury, and deprivations which a greater and even more cruel war had left in its train.

Dr. H. Shaw, Director of the Science Museum, moved a vote of thanks to the French authorities for placing the exhibition at the disposal of the Science Museum and for the strenuous work they had done to make it ready, and to the other contributors to its success.

The exhibition includes several portraits of Pasteur, his masters, disciples, friends, and colleagues; enlarged photographs of Strasbourg, Lille, and other towns and districts where he lived; pictures of the Ecole Normale where he investigated molecular dissymmetry, of Salins and Montenvers where he worked on spontaneous generation and other places made famous by association with him, and of members of his family.

He was a capable sketcher and pastel painter, and some of his portraits of his father, mother, and friends are shown. Striking models illustrate the preparation of antisera in laboratories in France's Oriental possessions, and enlarged photographs and display panels show graphically the significance of his discoveries of micro-organisms and immunity factors. The Wellcome Museum exhibit includes crystals and diagrams showing the foundations of stereochemistry which Pasteur laid. Much of his original apparatus in on view, together with some of his personal possessions.

[Sir Alexander Fleming's inaugural lecture on Pasteur appears in the opening pages of this week's *Journal*.]

Correspondence

Treatment of Post-operative Pulmonary Atelectasis

SIR,—In his letter (April 5, p. 468) Dr. M. H. Armstrong Davison speaks of "bronchoscopic aspiration, which, all observers agree, is the ideal method of treatment, and which should be undertaken as soon as signs of atelectasis appear . . ." I cannot agree with this remark, for if generally accepted it would lead to many unnecessary bronchoscopies and would serve to encourage the neglect of the various simple procedures which are quite effective in most cases.

I fully agree with Dr. Davison that atelectasis is the commonest post-operative chest complication. Its incidence depends, however, on many factors working together, before, during, and after the operation, and culminating in retention of sputum in the bronchi. Our efforts should be directed to preventing this occurring, or minimizing its effects, in addition to the treatment of the established condition; it is not enough to rely upon some one trick or other, in which category, incidentally, falls the method described in your annotation as a "new" treatment. I have always resisted the attempts to put bronchoscopic suction in a prominent place in treatment because the careless or inexperienced will thereby be encouraged to take no steps to prevent sputum retention or to establish bronchial drainage by simpler postural means. I am often asked to bronchoscope patients with atelectasis after abdominal operations in whom not the slightest attempt has been made to relieve the condition by the simple change of posture (lying flat on the side two or three times a day) and encouragement to cough. I find bronchoscopic suction is but seldom needed in these cases, although it is of the greatest value after many operations upon the thorax. The use of postural coughing and other simple measures is mentioned in only the three last lines of Dr. Davison's letter and as having their place. They form the bed-rock of management. Moreover, although in expert hands bronchoscopic suction is no great burden and is effective, in unskilled hands and when the patient is a child or of a difficult build it may be far from a simple procedure or a light burden.

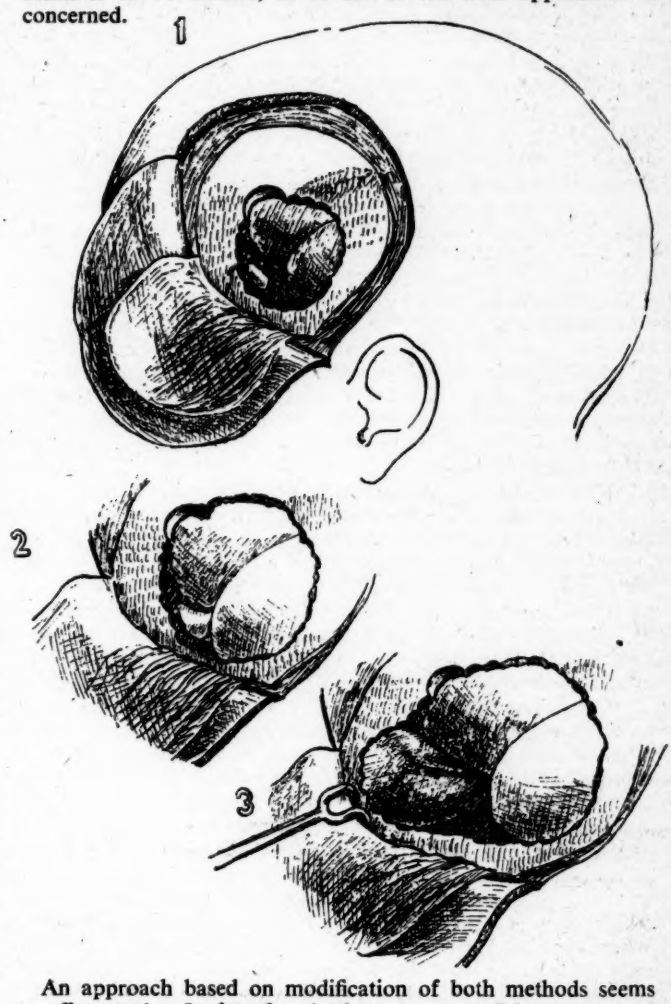
The method of injecting water through the wall of the trachea is an unnecessarily unpleasant way to provoke coughing. If it is desired to start a fit of coughing by the irritation of water in the trachea, why not use the large hole provided by Nature—that is, the laryngeal aperture—instead of puncturing the trachea? A curved laryngeal cannula would be just as effective.—I am, etc.,

London, W.1. R. C. BROCK.

Orbitotomy

SIR,—Mr. H. B. Stallard's article (March 29, p. 408) favouring the more generalized use of the Krönlein operation, rather than the transfrontal route advocated by the late Dr. Walter Dandy, must appeal to those interested in the surgery of the orbit. Although Dandy's justification is not to be accepted without comment, for it was based on an assumption that clinical investigation precluded recognition of the true distribution of a lesion, there is much to be said in favour of the approach, or possibly some modification of it. Nevertheless, Stallard's proposal calls for some further consideration.

Stallard maintains that the aesthetic result of the Krönlein operation is not that ugly scar ordinarily supposed. From time to time it is my privilege to see cases in which the lateral approach to the orbit has been carried out by highly reputable ophthalmic surgeons: my usual experience of the result is that much is to be desired, in so far as the final appearance is concerned.



An approach based on modification of both methods seems to offer much. In fact for the last two years I have operated through the scalp incision of Dandy's procedure, but have avoided the reflection of an osteoplastic flap. The scalp having been reflected, the temporal muscle is turned down from the crest. A perforation is made from the temporal fossa into the orbit and the defect extended by means of nibbling forceps, to produce a combined cavity consisting, if necessary, of the orbit, the middle fossa, and the anterior fossa. By such means a very extensive decompression is permitted. This operation has been found applicable to all forms of orbital exploration; more especially is it of value for the extensive relief it affords in a case of exophthalmic ophthalmoplegia.

As one may appreciate from the operative sketches, the somewhat facetious designation of the exposure as the "pawnbroker" operation will appear appropriate. I am indebted to Dr. S. L. S. Schwarzwald for the drawings.—I am, etc.,

London, W.C.1. HARVEY JACKSON.

The Revolution in Anaesthesia

SIR,—Times have changed, but still how often does this occur? A patient made stuporous with scopolamine and "omnopon" is brought to the anaesthetic room, and after his throat has been sprayed with a solution of cocaine he is rendered completely unconscious by means of an intravenous barbiturate. The next few minutes disclose a scene of bustling activity. An endotracheal tube is inserted and this tube or the patient's face is attached firmly to that particular form of anaesthetic apparatus favoured by the anaesthetist: cyclopropane is next administered, and the patient, barely breathing, but still indissolubly linked to the machine, is taken into the operating theatre. A short time elapses till the surgeon compliments the anaesthetist on the quiet relaxed operation field; an audible sigh of relief is heard. If on the other hand the

remark "He's still a bit tight, doctor" is passed, how quickly a "shot" of "tubarine" secures the desired result, while the reply "He's a very resistant type" satisfies honour; but none marvels at the miracle of what the human body can withstand. Several hours later the patient is just sufficiently conscious to be told that his operation is over, and he sinks once more into the twilight of that half-world known as "recovering from the anaesthetic." He does recover and reaches convalescence, often without complications; yet none wonders at the miracle. Possibly the picture is overdrawn, but if it is a caricature the implications are nevertheless true.

We use to-day powerful agents which have revolutionized anaesthesia: is it strange therefore to affirm that when they are used the whole conception of anaesthetic administration must also be revolutionized? Every phase of modern technique affects the respiratory act either centrally or mechanically. The anaesthetist must breathe for the patient, and the old conception that as long as the patient was breathing everything was all right must be forgotten and a new approach substituted. The moment these drugs and these methods are used the anaesthetist is wholly responsible for the gaseous exchange in the lungs of his patient and hap what hap *there must be no anoxia.* This can only be assured by the constant and intelligent manipulation of the rebreathing bag of a sound closed circuit. Till this is realized, shock, ileus, post-operative vomiting, and many other complications will always occur.

The day of heavy premedication has passed, for with the advent of the intravenous barbiturates the terror of induction has been removed and the slow recovery of consciousness and the essential reflexes, consequent on the production of pre-operative peace, should now never be seen. Minimal premedication given at the right time is all that is required nowadays.

Crile's theory of shock is now outmoded; it has been replaced by the solid biological fact that so long as blood loss is made good and provided that there is no anoxia, with few exceptions, the lighter the plane of anaesthesia the more readily can the neurovascular mechanism of the body withstand the onset of shock. It is sufficient, therefore, to maintain the patient in a light first-plane anaesthesia by the judicious use of the intravenous barbiturates, supplemented when necessary by the exhibition of a minimal quantity of cyclopropane, while relaxation is secured by the addition of *d*-tubocurarine chloride. When these three drugs are used in combination they potentiate each other in a remarkable way, consequently toxic after-effects are greatly minimized: but there must be no anoxia.

Anaesthesia conducted on these lines, no matter how severe the operation, will present a patient who coughs on the table and will often speak; one who on being returned to the ward is able to sit up immediately and is fully co-operative within half an hour. After this if he is nursed in a steam tent and an adequate fluid intake is assured—by the intravenous route if necessary—the bronchial secretions are kept fluid, with the result that coughing, with the wound area adequately supported, is productive and post-operative complications are avoided.

These few observations result from the experience in the use of *d*-tubocurarine chloride over a period of two and a half years.—I am, etc.,

Liverpool. JOHN HALTON.

Anaesthesia for Caesarean Section

SIR,—The recent discussion on anaesthesia for caesarean section at the Royal Society of Medicine, reported in your issue of April 5 (p. 463), gives the impression of undiluted and almost unchallenged spinal, epidural, or caudal anaesthesia as being the method of choice. If this is so I feel that it is unfortunate and should not be left uncontested. The various speakers pointed out the disadvantages, such as the need for taking readings of blood pressure during operation, the not infrequent necessity for stimulants, and the fact that it was not suitable for certain types of case, but insufficient stress was laid upon these disadvantages, and the effect upon the patient was barely mentioned.

It must be admitted that an experienced anaesthetist can make a success, surgically speaking, of practically any type of anaesthesia one likes to mention. There is no onus on an obstetrician to make himself familiar with spinal anaesthesia in its various techniques, but there is, I would suggest, every onus upon him to familiarize himself with the details of local anaesthesia. This was referred to by Mr. C. Macintosh Marshall and Prof. Chassar Moir, but it was not sufficiently emphasized that this can often be a life-saving method. It is applicable either alone or with the addition of inhalation or intravenous anaesthesia for any and every case in which this operation is required, and in those in which the patient's condition gives rise to anxiety it is very often the only type of anaesthetic which should be used. If this were more widely recognized a considerable saving of life could undoubtedly be effected.

Its disadvantages lie only in a little added discomfort to the mother and the distaste many of us have for operating upon a conscious patient. The former can be largely avoided by careful handling and good technique, the latter by the use of inhalation anaesthesia in addition, which is, I believe, the real method of choice. It is, however, very hard to better the results obtained from the point of view of both patient and surgeon by a sequence of gas, oxygen, and chloroform, followed, after delivery of the child, by a little ether or what you will given by a competent anaesthetist.—I am, etc.,

London, W.1. F. NEON REYNOLDS.

SIR,—The recent interest in this subject at the Royal Society of Medicine (April 5, p. 463) and Dr. T. C. Gray's article on the use of *d*-tubocurarine in caesarean section (April 5, p. 444) will no doubt result in many conflicting opinions. While it is encouraging to read of dissatisfaction with the older methods, it is disappointing to see so little support for the use of local anaesthesia. The only objection appears to be that it is unpleasant for the patient, and even so great an advocate as Mr. C. Macintosh Marshall refers to ameliorating the rigours of this method. In my view the unpleasantness is greatly exaggerated, chiefly by those who have used the method only a few times and who have discarded it after the initial disappointments which inevitably precede the attainment of a satisfactory technique.

Failure is usually due to one of two reasons. The first mistake is to expect too much from local anaesthesia alone. In the lower-segment operation it is practically impossible to deliver painlessly a head deeply engaged in the pelvis without the aid of some additional anaesthetic. Closing the abdomen may also be painful if the operation has not been completed in reasonable time and the effect of the local anaesthetic is wearing off. Both of these disadvantages may be met by the addition of gas and oxygen when necessary. The amount required is minimal, and a high proportion of oxygen can be given, because adequate relaxation should be obtained from the local anaesthetic. The second mistake concerns the actual technique. A considerable amount of deep "fanning out" of the injection is necessary in the suprapubic region. This is where most of the discomfort is felt, and it is aggravated by the pressure of the Doyen retractor. Needless to say the injection is greatly facilitated by the use of a continuous-action syringe. The use of a sucker will minimize the painful swabbing of the peritoneal cavity.

The psychological approach to the patient is also important. Conversation and an explanation of what is happening are a great help, and it should be remembered that most operating tables are extremely hard. The use of "omnopon" and scopolamine immediately after the birth of the child undoubtedly has a retrograde amnesic effect.

In this unit local anaesthesia has been used a great deal, although it was discarded temporarily after the first few attempts for the reasons given above. It is now used more than any other method, but only with the object of delivering the baby entirely with local anaesthesia. After this, although the operation can be completed without further anaesthesia, there is no reason to withhold gas and oxygen, and it is usually given.

If this combined method is planned deliberately, and the addition of gas and oxygen after the birth of the child is regarded not as a "failure of local anaesthesia" but as an essential part of the technique, there should be no need to look for other methods involving complicated apparatus, "aided" respiration, foetal narcosis, and the constant watch for sudden collapse of the mother.—I am, etc.,

North Herts Maternity Unit. D. W. JAMES.

Co-operation of Obstetricians and Paediatricians

SIR,—Reference has been made in recent numbers of the *Journal* to the desirability of obstetricians and paediatricians co-operating in their joint interest in the newborn infant. I should like to emphasize the value of such an experience in the light of the practice in the Belfast Medical School.

Every month the obstetricians and paediatricians of the maternity hospitals in Belfast meet to review the obstetric and paediatric problems of the previous month. The audience includes, in addition, the pathologist, anaesthetist, obstetric and paediatric registrars and tutors, senior and junior R.M.O.s, and the appropriate members of the nursing staff. Representatives of the Ministry of Health and of the Belfast Corporation Maternity and Infant Welfare Department also attend. The programme includes statistics of the number of births, proportion of caesarean and forceps deliveries, etc., data relating to maternal and infant mortality and morbidity, as well as details of stillbirths and neonatal deaths. Discussions take place on incidents of special interest, and questions are answered by the obstetrician and paediatrician in charge, with reports from the pathologist. Following this general review there is always time for discussion on one or more selected topics (sometimes presented by one of the registrars or tutors), often based upon an analysis of statistics obtained from the hospital records.

The value of this meeting is obvious, as obstetricians and paediatricians learn something of the problems as seen by the other. The sustained interest of those who attend regularly month after month has been sufficiently encouraging to make the meetings a recognized feature of the Belfast Medical School. The project owes its inception to the inspiration and enthusiasm of Prof. C. H. G. Macafee.—I am, etc.,

Belfast. F. M. B. ALLEN.

Diphtheria in an Immunized Community

SIR,—I have read with great interest the articles in your issue of March 22 on outbreaks of diphtheria in a highly immunized community and in adults. I have observed since 1941 in Italian populations an increase of diphtheria in adults in comparison to the child morbidity, and since then the same phenomenon has been described in nearly every country in Europe and elsewhere. But I was surprised not to find any mention of the method of restoration of diphtheria immunity in adults and vaccinated children described by G. Bousfield (*Journal*, June 16, 1945, p. 833). We have tried the oral administration of toxoid in adults (in Milan and Naples), and have obtained with the vaccine we have prepared better results than the Bousfield ones: one 100-Lf tablet daily for seven days was sufficient in more than 90% of the adults to provoke a very striking increase of antitoxin in the blood serum after 20 to 25 days (in many cases from <0.02 unit to more than 2 units). After these results it is difficult to exclude *a priori* the possibility of immunizing also small children by this method or some modification of it, and we have undertaken experiments in this direction. But it is certain that a new weapon against diphtheria in adults is already in our hands, and we should not forget to use it largely.—I am, etc.,

Naples. E. CARLINFANTI.

Arsenical Encephalopathy

SIR,—A case of arsenical encephalopathy with which I had to deal in 1938 showed the typical signs mentioned by Dr. J. M. H. McMurray (March 22, p. 388)—headache developing in an Indian after the third intravenous injection of N.A.B., followed by convulsions and death within 48 hours, with high terminal temperature.

But this case differed from those of Dr. McMurray and from that mentioned by Drs. G. Hipps and R. Goldberg (March 8, p. 296) in that the patient was a congenital syphilitic. Before coming to this country he had undergone courses of treatment with "myosalvarsan" and "bismostab" intramuscularly, so it would seem that it is the intravenous route of arsenical therapy which is the factor in the causation of encephalopathy.—I am, etc.,

London, S.W.1. J. STUART HENSMAN.

International System of Weights and Measures

SIR,—May I plead with Dr. J. M. Hamill to cease advocating the substitution of the title "International System of Weights and Measures" for the "metric system." In his useful article (April 5, p. 460) Dr. Hamill argues that because there is no simple metrological relationship—that is, no whole-number relationship—between the metre and the kilogram and litre, these last two are no longer part of the metric system. But there is a historical relationship, and verbal precision is satisfied, for the title "metric system" is an example of that much-used figure of speech which grammarians call a metonymy.

For some rapid estimations in engineering, if not in medicine, the relationship between the metre and the kilogram and litre is close enough to be of help. The difference of 28 parts in one million (I prefer the British Standards Institution figure to Dr. Hamill's) is not great enough to destroy altogether the relationship originally intended.

I write feelingly because I advocate the standardization of the metric system in aviation. In March, 1946, I adopted the metric system as the primary system of weights and measures in my paper *Aeronautics*. The system has been making progress in aviation. The International Civil Aviation Organization (formerly P.I.C.A.O.) has adopted it for all its publications, though it still gives the British Imperial equivalents. British airline companies use it as well as papers on aviation read before the learned societies. But the way of standardization is hard, especially in view of the idiot opposition of Government departments. It would be made even harder if, in place of the familiar name which is historically and grammatically correct and is brief and definite, we were to try to impose an unfamiliar, indefinite, and clumsy name.—I am, etc.,

London, W.C.2. OLIVER STEWART, Editor, *Aeronautics*.

Dirty Milk Bottles

SIR,—Dr. J. H. Wildman's comments on this subject (March 29, p. 425) ignore the fact that where there are no canteen and washing-up facilities milk bottles cannot be washed at schools. The lack of facilities for hand washing and, even more, hand drying (one towel for 30–40 children changed twice weekly is a typical provision in my area) makes the teaching of hygiene a farce.

Doctors associated in any way with schools could greatly assist the efforts made by parents and teachers to remedy this situation if, having informed themselves of the lavatory and hand-washing facilities available, whether these are a Church or education authority responsibility, they would refuse to accept our present shortages as a reason for all deficiencies. For more than twenty years this situation has frustrated teachers and distressed parents and children. The time has come for doctors to help in the struggle for an opportunity for children to acquire practical habits of hygiene.—I am, etc.,

Farnham, Surrey. NORA M. JOHNS.

24-hour Day

SIR,—A simple plan for doctors to maintain a 24-hour telephone service in the absence of anyone to take the messages would be the installation of a small recording unit which could be switched on in place of the telephone when the house is left, and which only comes into operation when a call is attempted.

I suggest that these units could be made, using the magnetized steel-tape method, which after the messages have been read could be "rubbed out" and used again. Thus anyone wishing to call the doctor when he is out would hear a preamble from an incorporated record such as: "Doctor —— is out. You will have two minutes to deliver your message, which will be recorded. Please start with the patient's name, age, and address." The apparatus would soon repay its cost, as a part-time secretary could just come in for an hour at stated times to put the messages into writing. For the use of callers a pad and pencil could be provided in the porch.—I am, etc.,

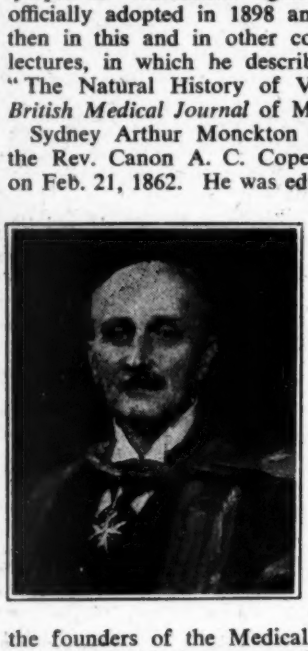
Winsley Sanatorium, near Bath. E. S. SHORT.

Obituary

S. MONCKTON COPEMAN, M.D., F.R.S., F.R.C.P.

We regret to announce the death on April 11 of Dr. S. Monckton Copeman at the age of 85. Dr. Copeman has his place in medical history on account of his introduction of glycerinated lymph in vaccination against smallpox. This lymph was officially adopted in 1898 and has been in general use since then in this and in other countries. Dr. Copeman's Milroy lectures, in which he described his work under the title of "The Natural History of Vaccinia," were published in the *British Medical Journal* of May 7, 14, and 21, 1898.

Sydney Arthur Monckton Copeman was the eldest son of the Rev. Canon A. C. Copeman, and was born at Norwich on Feb. 21, 1862. He was educated at King Edward VI School in that city and at Corpus Christi College, Cambridge, where he was a scholar, exhibitioner, and prizeman. After obtaining second-class honours in the Natural Science Tripos in 1882, he received his medical training at St. Thomas's Hospital. He proceeded to the M.D.Cambridge in 1890, and was elected F.R.C.P. in 1899. After qualification he was assistant lecturer on physiology and morbid histology at St. Thomas's. In 1891 he became a medical officer to the Local Government Board, and in the same year was one of the founders of the Medical Research Club. His papers on the relationship between variola and vaccinia were published in the *Proceedings of the Royal Society*, and his reputation established by these and his work on glycerinated lymph led to his election as F.R.S. in 1903. He received the Buchanan gold medal of the Royal Society in 1902; and other distinctions that came his way in that period were Cameron Prizeman of the University of Edinburgh in 1899, and Fothergillian Gold Medallist of the Medical Society of London in the same year. Among his early papers was one on the specific gravity of the blood in disease, and another on haematoporphyrin in urine. He was the author of many reports on public health matters and contributed to the *Encyclopaedia Britannica*.



Copeman had a long and distinguished career in the public health services in this country and visited many parts of the world in connexion with investigations carried out on behalf of Government departments. In the war of 1914–18, as lieutenant-colonel, Copeman was in charge of the Hygiene Department of the Royal Army Medical College. He played an active part in many medical societies and organizations. He was, for example, Research Scholar and Special Commissioner of the British Medical Association; a member of the Council of the Royal College of Physicians; a member of the Faculty of Medicine, and chairman of the Board of Studies in Hygiene of the University of London; examiner in public health and in forensic medicine and toxicology in the University of Bristol; examiner in public health, Royal College of Physicians and the University of Leeds. After he retired from the service of the Ministry of Health in 1925, Copeman began to play an active part in the affairs of local government. For many years he was a member of the London County Council. He was also a member of the Hampstead Borough Council and chairman of its Public Health Committee.

He joined the British Medical Association in 1888, and was secretary of the Section of Public Medicine in 1892. At the Annual Meeting of 1910 he was vice-president of the Section of State Medicine. He was at one time chairman of the Hampstead Division, and took part in the central work of the Association as a member of the Science Committee (1932 and 1936) and of the Library Subcommittee (1933).

Copeman was distinguished in appearance and unfailingly courteous in manner. His wide culture brought him into contact with men and women in many walks of life. He married Ethel Margaret, youngest daughter of the late Sir William Boord, Bt., and had a son and two daughters. His son is a consulting physician in London.

Sir Arthur MacNalty writes:

The death of Monckton Copeman at the advanced age of 85 removes one of the few survivors of the medical staff of the Local Government Board, who accomplished great things in the organization of public health in the nineteenth century and early years of the present century. Copeman, after a distinguished career at Cambridge and St. Thomas's Hospital, became a medical inspector of the Local Government Board in 1891, and all his active medical life was spent in the service of that department and, subsequently, as a medical officer of the Ministry of Health. His discovery of the value of glycerin in destroying pathogenic organisms associated with calf-lymph, the use of glycerinated calf-lymph in vaccination, and his papers in the *Proceedings of the Royal Society* on the relationship of variola and vaccinia early established his scientific reputation, and for this work he was made F.R.S. in 1903. The use of glycerinated lymph abolished arm-to-arm vaccination and made vaccination a much safer and simpler operation. For this alone Copeman deserves to be remembered.

Although Copeman served on many departmental committees his real interest lay in scientific research, and his alert mind, fertile in new ideas, was directed to various subjects of inquiry. During his latter years at the Ministry of Health he devoted special attention to the cancer problem, and his report with Prof. Major Greenwood on *Diet and Cancer with special Reference to the Incidence of Cancer upon Members of certain Religious Orders* opened a new field of inquiry. He was a member of the Ministry of Health's Departmental Committee on Cancer, where his advice and ripe experience proved of much value. He was also a pioneer in immunization against diphtheria in this country. Endowed with untiring energy and enthusiasm, he found time in a busy official life to develop Army hygiene during the war of 1914–18. Keenly interested in natural history, he was a member of the Council of the Zoological Society and did much to improve its work on scientific lines.

Copeman had a generous and kindly disposition. A man of many interests and of wide culture, he was a delightful companion, and I learned much from him during the years that we shared a room together in the Ministry of Health. He wrote to me frequently in recent years, and his letters denote how well he kept himself informed of modern progress in medical research.

The life of Monckton Copeman was devoted to the public service and to the prevention of disease, and he did much to maintain the high standard of English State Medicine.

EDWARD J. M. WATSON, M.D., F.R.C.P.

Dr. Edward John Macartney Watson died at his home in Dublin on March 22 at the age of 74 after only a few days' illness. A son of the late Sir William Watson, managing director of the City of Dublin Steam Packet Co., he was educated at Eton, and before entering Trinity College, Dublin, in 1895, he studied engineering at Trinity College, Cambridge. There he gained his blue in athletics and was a member of the team which toured Canada and the U.S.A. In 1900 he graduated, and in 1906 he became a Fellow of the Royal College of Physicians in Ireland. Shortly after graduation he was appointed assistant physician and anaesthetist to Sir Patrick Dun's Hospital, where he had been a student, and in the same year he was put in charge of the *x*-ray department, a post which he held until his death. For some years he also held a similar appointment at the Richmond Hospital. In 1923 he became, in addition, physician in charge of the *x*-ray department at the Adelaide Hospital. During the first world war he served as radiologist to Dublin Castle Red Cross Hospital, and in France with the R.A.M.C. on the staff of the 83rd (Dublin) General Hospital. Subsequently he was appointed radiologist to the Ministry of Pensions Hospital at Blackrock, later transferred to Leopardstown, Co. Dublin, where he had attended as usual

four days before his death. Shortly after the war he married Ina, only daughter of the late T. O. Read and Mrs. Read of Roscrea.

Dr. Watson was a vice-president of the Radiological Society of Ireland, and throughout his professional career he practised general medicine in addition to radiology. Like many of his early fellow workers he suffered much from *x*-ray burns, necessitating several operations, but he bore his disabilities uncomplainingly. Edward Watson, though he never paraded them, was a man of deep religious convictions, and his charity was, like all his actions, unobtrusive. He was always interested in Church matters, and for many years, in addition to various parochial appointments, acted as medical referee to the Representative Body of the Church of Ireland. He served on the committees of several philanthropic institutions, in which he took a lively interest, and to the success of which he contributed in no small measure by a calm and logical outlook, characteristic of the man.

His non-professional interests lay to a large extent in the field of athletics, and for many years he had been an active force both in the Dublin University Central Athletic Association and the Rugby Football Club. As a Commissioner of Irish Lights since 1923, nothing short of incapacity was allowed to interfere with his attendance at the weekly meeting of that body, which is responsible for all navigational apparatus on the Irish coasts. One of his greatest pleasures was to take part in the annual cruise of inspection around Ireland. He was indefatigable in the discharge of the duties involved, which often entailed hazardous landings in heavy seas, and for which he was well qualified by his engineering training and family association with shipping. A skilled woodworker, in the early days he constructed many ingenious and beautifully finished articles of *x*-ray equipment.

Though one of the most retiring of individuals, Edward Watson had a wide circle of friends, and if any evidence of his popularity was needed, ample proof was forthcoming in the very large attendance at a memorial service held in Christ Church, Leeson Park, where he had worshipped since childhood.

ERNEST WATT, O.B.E., M.D., F.R.C.P.Ed.

Dr. Ernest Watt, for many years a medical officer of the Department of Health for Scotland, died at his home in Edinburgh on March 26 at the age of 71. He had a most distinguished academic career at Glasgow University, graduating M.B., Ch.B. in 1897, M.D. in 1901, B.Sc. (Public Health) in 1912, and D.Sc. in 1917; he took the D.P.H. at Cambridge in 1905, became a member of the Royal College of Physicians of Edinburgh in 1916 and was elected to the fellowship in 1931. After service as house-physician and house-surgeon at the Victoria Infirmary, Glasgow, he held resident posts at the City of Glasgow Fever Hospital and the Glasgow Royal Maternity Hospital. Next came a short spell in general practice, after which he returned to hospital work as resident physician and bacteriologist to the Ochil Hills Sanatorium and, later, physician-superintendent of the Middle Ward of Lanarkshire Hospital. Successive appointments followed as senior assistant to the county medical officer of Lanarkshire, M.O.H. of the Burgh of Partick, and chief tuberculosis officer for the County of Durham. While working in Partick he acted as assistant to the professor of forensic medicine and public health, Glasgow University. In 1913 he was appointed tuberculosis medical inspector to the Local Government Board for Scotland, continuing the same duties as a medical officer in the Scottish Board of Health and later in the Department of Health for Scotland until he retired in May, 1941. In 1939 he was awarded the O.B.E.

Widely known in Scottish medical circles, Ernest Watt's opinion was freely sought on all matters connected with tuberculosis, a subject on which his knowledge was extensive and profound. He was no narrow specialist, however, and many of his professional associates profited from his mature experience in general public health. He had wide cultural and scientific interests and for many years he was a member of the Astronomical Society of Edinburgh, of which for a year he was vice-president. All his academic attainments, experience, and interests apart, it is the man himself who will be best remembered. Unassuming, patient, and imperturbable at all times, his gentle, kindly disposition made him intuitively seek the good points in his fellow men, though he was not unaware of the failings of those who fell short of his own high standards. He will be greatly missed by all who had the privilege to know him.

"F. S." writes: Dr. Ernest Watt was one of a small band of medical officers of the former Scottish Board of Health under the inspiring leadership of the late Sir W. Leslie Mackenzie. The domain in which, in addition to medicine, his knowledge was outstanding was science, pure as well as applied. Among many other evidences the high standard of his attainments therein was well illustrated in the treatise written by him in 1925, in collaboration with the late Dr. Lewis D. Cruickshank, and entitled *An Interim Report on Artificial Light and X-Ray Therapy*. In the more strictly medical sphere tuberculosis was the subject in which he specialized, and in which he served so acceptably as an official consultant. As a churchman his interests and his influence were life-long.

If he could be numbered among the most highly qualified and the most scientifically minded, certainly he could also be accounted as the most modestly unassuming of all the many medical men whom the writer has met and with whose friendship he has been privileged. Especially conspicuous in his character was candour. Anything of the nature of duplicity or of subterfuge was alien to him.

ENEAS K. MACKENZIE, M.D.

Many members of the profession learnt with regret of the sudden death, at the age of 65, on March 27, of Dr. Eneas Kenneth Mackenzie, of Tain. Educated at Inverness Royal Academy, he studied medicine at Aberdeen University, where he graduated M.B., Ch.B. in 1906, proceeding M.D. in 1909. For over thirty years he practised in Tain. He was a man of great character and outstanding ability. He gave his patients of his best and was much beloved and greatly respected. Dr. Mackenzie took a keen interest in the organization of the medical services in the North of Scotland and in the development of the Royal Northern Infirmary, Inverness. A Highlander, with more than the usual amount of Highland pride, he contributed in no small measure to the reputation which the Highlands and Islands Medical Service so richly deserves. He was particularly interested in obstetrics, in which he was widely recognized as an authority. He had an orderly mind, and differed from the great majority of doctors in that he enjoyed keeping meticulous records of his work. He was intolerant of authority, and when roused expressed himself with characteristic Celtic fervour. He had, too, oratorical gifts of a high order. Yet he was the most humble of men and inspired affection in a remarkable degree.

He was appointed a member of the Medical Advisory Committee to the Secretary of State for Scotland at its inception. For two years he was chairman of the Highlands and Islands Subcommittee of the Scottish Committee of the British Medical Association, succeeding that other well-known Highland practitioner Dr. J. B. Simpson, late of Golspie. Eneas Mackenzie had held office as president of the Branch, as chairman of the Panel Committee, and as an examiner for the Central Midwives Board for Scotland. For eighteen years he was chairman of the Ross and Cromarty Insurance Committee. His capacity in other spheres was recognized by his appointment as an honorary sheriff-substitute for the county.

For some years he had been in indifferent health, and it was difficult for a man of his temperament to take things quietly. He died, as he desired, while still actively engaged in practice. Dr. Mackenzie is survived by his wife and two sons. His elder son is a lieutenant-colonel in the Indian Medical Service, the younger a dental surgeon-lieutenant in the Royal Navy.

The British Legion Village is to establish a nurses' home in the centre of Colchester for nurses employed at Nayland, the British Legion sanatorium for ex-Service women and dependants which lies nine miles outside the town. Nayland will be the first sanatorium in the country to provide such a facility for its staff. Transport will be provided to convey the nurses between the home and the sanatorium.

Universities and Colleges

UNIVERSITY OF OXFORD

Election of Two Members of the Board of the Faculty of Medicine by the General Medical Electorate

An election of two members of the Board of the Faculty of Medicine will be held on Wednesday, June 4. The members elected will come into office on the first day of Michaelmas Term, 1947, and will hold office, the senior for two years and the junior for one year from that day. The General Medical Electorate consists of all Oxford graduates in medicine who are members of Convocation. The Board of the Faculty of Medicine includes two members elected by the General Medical Electorate who must be members of that body and of whom one at least must be a person engaged in teaching one or more of the clinical subjects of the Faculty. Nominations of duly qualified candidates for election will be received by the secretary of Faculties at the University Registry, Oxford, up to 10 a.m. on Wednesday, May 14. Each nomination must be signed by six members of the General Medical Electorate, and no candidate will be eligible whose nomination has not been received by that date.

The Electors have awarded the George Herbert Hunt Travelling Scholarship to Selwyn Francis Taylor, B.M., M.Ch., of Keble College.

UNIVERSITY OF CAMBRIDGE

Sir Howard Florey, M.D., F.R.S., professor of pathology in the University of Oxford, will deliver the British Association's Radford Mather Lecture in Regent House, on Friday, May 2, at 5 p.m. His subject is: "Penicillin and other Antibiotics."

UNIVERSITY OF LONDON

A course of six public lectures on "Cell Physiology and Pharmacology" will be given by Dr. J. F. Danielli in the Department of Pharmacology of University College on Fridays, at 5.15 p.m., from April 25 to May 30. Admission is free and without ticket.

University College Hospital Medical School

A revision course of three weeks' duration in preparation for the examination for the Diploma in Anaesthetics will be held at University College Hospital Medical School beginning on Monday, April 21. The course is comprehensive in scope, including anatomy, physiology, applied physics, and pharmacology, and is limited to 25 members. The fee is £21 inclusive. Applications to join should be addressed to the secretary, University College Hospital Medical School, University Street, W.C.1.

UNIVERSITY OF SHEFFIELD

Profs. C. P. Beattie and C. H. Stuart-Harris have been appointed representatives of the University at the fourth International Congress of Microbiology to be held at Copenhagen from July 20 to 26.

UNIVERSITY OF DURHAM

Prof. G. Grey Turner, M.S., F.R.C.S., will give the first Rutherford Morison Lecture in the Royal Victoria Infirmary, Newcastle-upon-Tyne, on Thursday, May 29, at 5.15 p.m. His subject is "Rutherford Morison and his Achievement in Surgery."

ROYAL COLLEGE OF SURGEONS OF ENGLAND

Election of Professors and Lecturers

The Council of the College invites applications for election to the office of Hunterian Professor, Arris and Gale Lecturer, Arnott Demonstrator and Erasmus Wilson Demonstrator for the ensuing year. The twelve Hunterian Lectures are delivered by Fellows or Members of the College. The three Arris and Gale Lectures are on subjects relating to human anatomy and physiology, the six Arnott Demonstrations on the contents of the Museum, and the six Erasmus Wilson Demonstrations on the pathological contents of the Museum. Applications in writing must reach the assistant secretary of the College (Lincoln's Inn Fields, W.C.) by April 28. Candidates for the Hunterian Professorships and the Arris and Gale Lectureships are requested to submit with their applications twenty copies of a synopsis of approximately 500 words describing the subject matter of their proposed lecture. In the case of Hunterian Lectures the Council is prepared to consider applications for either a series of lectures or a single lecture. Lecturers will be appointed subject to the condition of giving the College first refusal of publishing their lectures in the *Annals of the Royal College of Surgeons*.

Practical demonstrations in anatomy, applied physiology and pathology have been arranged by Profs. F. Wood Jones, John Beattie, and R. A. Willis, beginning on Monday, July 7, and continuing until Tuesday, Sept. 30, from 10 a.m. to 1 p.m., and from 2 p.m. to 3.30 p.m. daily. The fee is £21, and the closing date for applications is May 12. The demonstrations will be open to those attending the main course of lectures to be held in July and September and will be limited to 40 students; preference will be given to those unable to obtain practical instruction elsewhere and to ex-Service men. Applications, accompanied by a cheque for £21, should be sent to the assistant secretary, Royal College of Surgeons of England, Lincoln's Inn Fields, London, W.C.2.

Medico-Legal

REMUNERATION OF AGENCY NURSES

[FROM OUR MEDICO-LEGAL CORRESPONDENT]

The Nurses Act, 1943, made "nurses' co-operations" subject to licensing and inspection by local authorities. Section 8 (2) provides that in licensing an agency for the supply of nurses a local authority may attach such conditions to the licence "as they may think fit for securing the proper conduct of the agency." In renewing the licences in the London area this year, the London County Council attached a number of new conditions. These prohibited an agency from charging a client more than the rates laid down in schedules attached to the licence, and also from removing a nurse from service without giving reasonable time to replace her.

Mr. Lewis Miller, the proprietor of the London and District Nursing Association, which supplies about 400 nurses a year, appealed to the Clerkenwell Petty Sessions on the ground that the new conditions were illegal. His counsel, Mr. G. R. Blanco White, K.C., pointed out in the course of his argument that if the salary limits were valid a trained nurse of fifteen years' experience would get £5 3s. 10d. a week against the £6 1s. earned by a bricklayer's labourer. Mr. C. Erskine Simes, K.C., for the Council, said that it was merely imposing a scale which had been agreed upon by the employees and representatives of various nursing bodies and by the Minister of Health, and which was a reasonable scale. Mr. Bertram Reece, the stipendiary magistrate, giving judgment on March 31, said that in his view—"only a temporary view"—the conditions were *ultra vires* of the Act, unreasonable, and against the public interest. He allowed the appeal and awarded 125 guineas costs against the L.C.C.

The issues in this case affect about 20,000 nurses, half of them in London, and raise fundamental questions concerning the proper place of agencies in the system of staffing hospitals up and down the country. Comment would be out of place until the appeal has been finally settled by the High Court, the Court of Appeal, or the House of Lords, all of which are open to the parties at successive stages.

A DEATH FROM PETHIDINE

The Westminster coroner inquired on March 28 into a death due to an overdose of pethidine (the hydrochloride of the ethyl ester of 1-methyl 4-phenylpiperidine 4-carboxylic acid). A clerk of 44 was found unconscious in a Paddington hotel and died soon afterwards. Four bottles of 3/4-gr. (50 mg.) tablets, from which 54 tablets were missing, were found in his room. Dr. G. Roche Lynch said in evidence that this was the first fatal case of pethidine poisoning he had met. The drug has an action similar to that of morphine. As it was discovered to produce addiction in some cases it was placed under the Dangerous Drugs Act in February last.

The Services

Lieut.-Col. W. H. Crichton, C.I.E., I.M.S., has been appointed a Commander of the Order of Orange-Nassau (with swords) for services when Director of Public Health and Welfare with 21 Army Group, B.L.A.

NAVAL MEDICAL COMPASSIONATE FUND

A meeting of the subscribers to the Naval Medical Compassionate Fund will be held at the Medical Department of the Navy, 64, St. James's Street, London, S.W.1, on Friday, April 25, at 3 p.m., to elect six directors of the fund.

No. 13

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended March 29.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for: (a) England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland.
Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for: (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.
A dash — denotes no cases; a blank space denotes disease not notifiable or no return available.

Disease	1947					1946 (Corresponding Week)				
	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)	(e)
Cerebrospinal fever	115	9	37	3	—	74	8	38	4	2
Deaths		2	—				1	2		
Diphtheria	254	28	46	16	18	478	36	115	51	17
Deaths	3	1	1		—	3	—	1	1	—
Dysentery	85	6	13	—	—	356	36	56	2	—
Deaths					—				—	—
Encephalitis lethargica, acute	1	—	—	—	—	—	—	—	1	
Deaths		1					—			
Erysipelas			41	6	7			41	7	—
Deaths		—					1			
Infective enteritis or diarrhoea under 2 years				33					40	
Deaths	74	10	14		1	66	10	4	11	1
Measles*	10,780	541	370	36	38	2,282	675	683	37	1
Deaths	21	1	—		1	3	—	3	1	—
Ophthalmia neonatorum	83	3	16	—	—	67	9	19	—	—
Deaths										
Paratyphoid fever	3	—	—	—	—	4	—	1 (B)	—	—
Deaths	—	—	—		—	—	—	—	—	—
Pneumonia, influenzal	1,025	65	16	15	2	1,079	69	31	14	5
Deaths (from influenza)†	38	3	5		2	50	7	6	4	5
Pneumonia, primary			273	33				360	31	
Deaths		68			16		57		17	16
Polio-encephalitis, acute	—	—				—	—			
Deaths		—					—			
Poliomyelitis, acute	7	1	2	1	1	6	—	3	—	—
Deaths		—					—			
Puerperal fever		1	29		—		3	20		1
Deaths										
Puerperal pyrexia‡	141	12	16	—	1	156	12	22	1	1
Deaths		—					—			
Relapsing fever	—	—			—	—	—			—
Deaths										
Scarlet fever	1,317	96	220	26	57	1,393	88	201	18	28
Deaths	1	—	—		—	—	—	—	—	—
Smallpox	1	1	—	—	—	2	—	—	—	—
Deaths					—	1			—	—
Typhoid fever	5	1	—	14	—	8	3	3	2	—
Deaths	—	—	—		—	—	—	—	—	—
Typhus fever	—	—	—	—	—	—	—	—	—	—
Deaths					—				—	—
Whooping-cough*	2,263	267	358	94	29	2,092	200	88	29	12
Deaths	25	2	4		3	8	1	1	1	—
Deaths (0–1 year)	549	69	69		21	408	61	64	47	24
Infant mortality rate (per 1,000 live births)										
Deaths (excluding still-births)	6,063	945	802		177	5,524	878	758	263	160
Annual death rate (per 1,000 persons living)			16·7					16·7	16·9	
Live births	10,678	1634	1355		313	8,392	1291	1017	511	268
Annual rate per 1,000 persons living			27·3					20·5	32·7	
Stillbirths	286	38	43			232	22	41		
Rate per 1,000 total births (including stillborn)			31					39		

* Measles and whooping-cough are not notifiable in Scotland, and the returns are therefore an approximation only.
† Includes primary form for England and Wales, London (administrative county), and Northern Ireland.
‡ Includes puerperal fever for England and Wales and Eire.
Return of births and deaths for Eire for weeks ended March 8, 15, 22, and 29 is not yet available.

EPIDEMIOLOGICAL NOTES

Outbreaks of Smallpox

Fifteen separate introductions of Asiatic smallpox occurred in England and Wales during 1946. Fortunately, on each occasion vaccination and surveillance of contacts brought the disease under control rapidly, and only 40 persons became infected during the year. In mid-February, 1947, after an interval of seven months, the disease again appeared, and since then 33 cases have been notified (15 at Grimsby, 2 at Stepney, 7 at Scunthorpe, 1 at Doncaster, and 8 at Bilston). The disease was introduced from an unknown source into a common lodging house at Grimsby, Lincs., when two old men sickened on Feb. 13 and 16. Subsequently 13 further cases arose, all in the direct line of contact with the original two cases. One was a man who had spent the night of Feb. 16 at the common lodging house, and subsequently developed smallpox at his home in Grimsby. Two members of the staff of the public health department (a sanitary inspector and a disinfector), both of whom had been concerned with the disinfecting of the common lodging house, developed smallpox while living at home. With the exception of these three, all the secondary cases occurred among contacts either at the common lodging house (4) or in the ward of the public assistance infirmary (6) into which the original patient was unfortunately admitted. The total number of cases in this outbreak was thus 15. There were 6 deaths, and the high mortality was associated with the advanced age of the persons affected and previous debilitating disease in 4 of them. The last case at Grimsby was removed on March 9, and the town is now believed to be free from infection.

It is probable that an unidentified contact from Grimsby infected an attendant at a hostel for seamen at Stepney. Fortunately this man was admitted to a general hospital early in the disease and there infected only one patient. Since the removal of this secondary case on March 21 no further cases have been notified in the London area.

The disease next appeared at Scunthorpe, 28 miles from Grimsby. The first patient resided in a common lodging house where two contacts who had absconded from surveillance at Grimsby were staying. Initially, this man was diagnosed as a case of varicella and admitted to an infectious diseases hospital. In the second generation 6 cases have been notified, the first developing the rash on April 4. They include a doctor vaccinated in infancy only and an unvaccinated nurse, both of whom were attending the patient; the others were residents at the common lodging house. Five contacts have absconded from this lodging house while under surveillance. Their whereabouts is unknown, and they may be incubating, or suffering from, smallpox.

There is no further information concerning the source of infection at Doncaster. The disease there, in a schoolmaster, was detected early, and prompt vaccination appears to have prevented further spread. Surveillance of contacts has now ceased.

All these cases appear to be infected with Asiatic smallpox of moderate severity. In contrast, the disease at Bilston, in Staffordshire, is said to be variola minor, although it originated in India or Cairo, more probably the former. The third generation of cases (with onset April 3 to 9, rashes April 5 to 10) numbers 5, one of whom, a woman aged 79, died during the prodromal period. The initial case and the second generation (2), although confidently diagnosed chickenpox until variola virus was isolated in the laboratory, remained confined to their beds from the onset, and the infection is believed to be limited to a circle of relatives and friends in three households. The clinical picture has been misleading. In two of the patients there were less than half a dozen lesions, and the illness is described as being like "influenza with a few spots."

Because of the difficulties in diagnosis and, more important, because ambulant cases of variola minor are sometimes relatively numerous and if missed may bring about a wide dispersal of infection, the reappearance of mild smallpox in the country should be viewed with apprehension and every effort made to detect new foci promptly. A medical officer of health should be consulted whenever there is the slightest suspicion.

At the time of going to press a further patient is under observation awaiting diagnosis at Rubery, near Birmingham.

Information received from Paris is to the effect that there were 32 cases of smallpox with 2 deaths between Feb. 10 and April 2.

Food-poisoning

There was recently an outbreak of food-poisoning at the County Mental Hospital, Winwick, Warrington. All the cases occurred

within twelve hours of one another, and the main feature was a mild diarrhoea which cleared up rapidly. No patient had a temperature above 98.8° F. (37.1° C.). Only four were considered ill enough for the relatives to be informed, but there were two women, aged 63 and 64, who collapsed and died a few hours after the onset. The number of patients affected was 25 out of a total of 150 in a ward which is an outlying block with a kitchen of its own. This ward is not connected with the main building in which some 1,800 other patients live.

Post-mortem examination of the two fatal cases showed a remarkable degree of enteritis and the presence of an intestinal obstruction, due in one case to diverticulitis and faecal impaction and in the other to a carcinoma of the bowel. Evidently the enteritis had caused a partial obstruction to become complete with extreme inflammation above the obstruction but little abnormality below it. The cause of death was returned at the inquest, in accordance with the medical evidence, as intestinal obstruction with non-specific enteritis as a contributory cause.

The fact that there was no outbreak of diarrhoea in the main building strongly suggested that the food (meat or fish, probably) was not likely to have been received in an infected condition. This was further confirmed by laboratory tests done on samples of the food still in stock from the same delivery. The infection must therefore have occurred in the ward itself and there must have been a sufficient lapse of time between the infection and the consumption of the food for enterotoxins to have been produced to a degree sufficient to account for the sudden and explosive outbreak. In any case, any organisms of the typhoid, dysentery, and Salmonella groups were ruled out by the negative results obtained from the examination of the stools of all affected cases. The only food to which this interval between infection and consumption could have applied was some mutton. This had been steamed the day before consumption and left overnight. A sample of this meat was retrieved from the swill and bacteriological examination showed the presence of a few unimportant organisms with a heavy infection by *Staphylococcus aureus*. The same organism was found in the bowel of the two patients who died. No septic cases were known to be under treatment at the time in the ward (they were all chronic mental cases who were up and about), and on searching for a possible source of infection it was found that a cat in the building had a post-lactational mastitis. Examinations were made and an almost pure culture of *Staphylococcus aureus* obtained. Further investigations are being made, and presumably phage typing will indicate whether the staphylococci recovered from the mutton, the fatal cases, and the cat are, or are not, identical.

Discussion of Table

In *England and Wales* an increase was recorded in the notifications of diphtheria 42 and dysentery 37 and a decrease was reported for measles 515 and scarlet fever 45.

The largest decreases in the incidence of measles were Yorkshire West Riding 132, Essex 128, and Middlesex 96. No large local variations occurred in the notifications of scarlet fever.

The only change of any size in the trends of whooping-cough was a decrease of 44 in Yorkshire West Riding. There was a small general rise in the incidence of diphtheria; Lancashire had 11 more cases. Dysentery was slightly more prevalent in most areas, and there was an increase of 15 in Middlesex, due to the outbreak at Southall M.B., where 17 cases were recorded during the week.

In *Scotland* the only changes of any size in the trends of infectious diseases were increases in the notifications of measles 142 and scarlet fever 42.

In Aberdeen 89 babies have died of gastro-enteritis during the past three months. The babies were nearly all bottle-fed and their symptoms were similar to those recorded in similar outbreaks in England.

In *Eire* 14 cases of typhoid were notified involving five different areas. Scarlet fever, whooping-cough, and measles were slightly more prevalent in Dublin C.B.

In *Northern Ireland* the notifications of diphtheria increased by 15. Notifications of whooping-cough in Belfast C.B. rose by 17.

Week Ending April 5

The notifications of infectious diseases in England and Wales during the week included: scarlet fever 995, whooping-cough 1,775, diphtheria 184, measles 8,343, acute pneumonia 730, cerebrospinal fever 86, dysentery 44, smallpox 2, paratyphoid 6, typhoid 8.

Medical News

Sir Alexander Fleming, F.R.S., leaves to-day (April 19) to lecture in Vienna on penicillin at the invitation of the Society of the Austrian Medical Profession and under the auspices of the British Council.

A meeting of the Tuberculosis Association will be held at King George V Sanatorium, Godalming, to-day (Saturday, April 19) at 11 a.m. At 2 p.m. there will be a discussion on "Some Complications following Adhesion Section," to be opened by Dr. James Watt, Mr. J. E. H. Roberts (Natural History and Treatment of Post-Operative Effusions), and Dr. W. E. D. Moore (Haemothorax); at 3.45 p.m. Miss M. Sheehan will read a paper on "Employment of Tuberculous Staff."

Meetings of the Biological Methods Group of the Society of Public Analysts and Other Analytical Chemists will be held at the Royal Society of Medicine (1, Wimpole Street, W.) on Monday, April 21, and Monday, May 12, at 6 p.m. The meetings form Parts 2 and 3 of a symposium on "The Production and Care of Laboratory Animals, Part 1 of which took place on March 17. The papers to be read are as follows: April 21, Dr. H. J. Parish, "Common Diseases"; Mr. N. T. Gridgeman, "Records." May 12, Drs. J. I. M. Jones and Eric C. Wood, "Housing." A general discussion on subjects covered by the papers read at all three meetings will follow. The meetings are open to the medical profession, members of which are invited to take part in the discussion.

The annual general meeting of the Food Group of the Society of Chemical Industry will be held at the Chemical Society's rooms (Burlington House, Piccadilly, W.) on Wednesday, April 23, at 6.30 p.m., when the chairman of the group will give an address on "Some Problems of Trade Effluent Disposal."

A meeting of the Medico-Legal Society will be held at 26, Portland Place, W., on Thursday, April 24, at 8.15 p.m., when a paper by Dr. David R. Mace on "Marriage Breakdown and Divorce" (Some Aspects of the Denning Report) will be read.

The annual general meeting of the Birmingham Local Section of the Institute of Metals will be held at the James Watt Memorial Institute, Great Charles Street, Birmingham, on Thursday, April 24, at 6.15 p.m. At 7 p.m. an address will be given by Dr. Neil G. Marr, on "Medical Services in the Non-ferrous Metals Industry." A discussion will follow.

The spring meeting of the British Orthopaedic Association will be held at Exeter on Friday and Saturday, April 25 and 26. At University College, Exeter, on April 25, at 9.30 a.m., there will be a symposium on "The Surgical Treatment of Tuberculosis of Bones and Joints," to which Mr. G. R. Girdlestone, Mr. Norman Capener, Mr. M. C. Wilkinson, Mr. J. P. Campbell, Mr. B. L. McFarland, and Mr. J. A. Cholmeley will contribute. At 2.15 p.m. there will be a clinical meeting at the Princess Elizabeth Orthopaedic Hospital, when a review of Devonian orthopaedic practice by the staffs of the hospital and of the Mount Gold Orthopaedic Hospital, Plymouth, will be presented. On April 26, at 9 a.m., there will be a business meeting at the Royal Devon and Exeter Hospital and from 10 a.m. to 1 p.m. various papers will be read.

A sessional meeting of the Royal Sanitary Institute will be held at Carlisle Town Hall on Friday, April 25, at 10.30 a.m., when Dr. F. H. Day will read a paper on "Dust in Domestic and Public Buildings: Its Nature and Properties."

A meeting of the Scottish Group of the Nutrition Society will be held at University College, Dundee, on Saturday, April 26, when there will be a discussion on "The Preservation, Colouring, and Flavouring of Foods." Members of the Food Group are invited to attend the meeting.

The first general meeting of the Kent Paediatric Society will be held at Farnborough County Hospital on Saturday, April 26, at 2 p.m., when Dr. Duncan Leys will give an address on "A County Paediatric Service." Membership of the society is open to all registered medical practitioners engaged wholly or partly in preventive or curative work among children, whether resident in the county or not, including general practitioners. Applications for membership should be addressed to the honorary secretary, Dr. P. N. Swift, Paediatric Unit, Farnborough Hospital, Kent. The annual subscription is 10s.

The British Council for Rehabilitation (32, Shaftesbury Avenue, London, W.1) is arranging a short course on rehabilitation to be held at Nottingham from April 29 to May 1. The fee of 3 guineas includes lunch and tea each day and transport from Nottingham to the places visited. The course will include addresses on "Hospital Rehabilitation," "Rehabilitation of Miners," and "Welfare and Rehabilitation in an Engineering Works." Vacancies are limited and applications should be sent not later than April 22.

Any Questions ?

Correspondents should give their names and addresses (not for publication) and include all relevant details in their questions, which should be typed. We publish here a selection of those questions and answers which seem to be of general interest.

Penicillin and Sulphonamides

Q.—*A patient with infected burns developed on the face a rash which subsided in a few days. Did the fact that she was undergoing a course of penicillin treatment automatically exclude erysipelas? Is there any clinical condition which, having failed to respond to adequate penicillin therapy, may respond to one of the sulphonamides? Has sulphamezathine any advantages over sulphathiazole or sulphadiazine? Is it correct that a twice-weekly intramuscular injection of 100,000 units of penicillin is less effective than 20,000 units three-hourly; and that 200,000 units twice daily is as efficient as the three-hourly courses?*

A.—True erysipelas, due to a haemolytic streptococcus, could not develop during a course of injections with penicillin in adequate doses. There are many conditions more or less susceptible to treatment with sulphonamides on which penicillin has no effect. They include bacillary dysentery; most coliform infections of the urinary tract; similar infections (for example, due to *Ps. pyocyanea*) elsewhere, including the meninges; any condition, whether sinusitis or pneumonia, due to Friedländer's bacillus; and undulant fever. The chief advantage of sulphamezathine is its slow excretion; moderate and infrequent doses thus maintain a continuous effect. It is also sufficiently soluble in urine to render the risk of obstruction remote—an advantage over sulphadiazine.

The last part of the question has recently been discussed in this column (Jan. 25, p. 167; Feb. 1, p. 207). It is impossible to answer the precise question asked here. A dose of 200,000 units produces an adequate blood level for no more than four to five hours; whether the very high level attained at the beginning of this period, with its resulting diffusion into the tissues, compensates for the succeeding period of seven hours during which the blood contains little or no penicillin can be decided only by observation in different types of case. One would certainly hesitate to rely on twelve-hourly administration if a patient's life were in danger. (See also in this issue an article at page 530 and an annotation at page 536.)

Fatal Dosage of Arsenic and Antimony Tartrate

Q.—*A woman of 42 took a horse "worm powder" in mistake for a headache powder and shortly afterwards collapsed. The powder contained 4 gr. (0.25 g.) of arsenic and 51 gr. (3.4 g.) of antimony tartrate. The stomach was washed out with tannic acid solution and she made an uninterrupted recovery. What are the usual fatal doses of arsenic and of antimony tartrate?*

A.—Two grains (0.13 g.) is commonly considered as a possible fatal dose of white arsenic, but different subjects vary greatly in susceptibility. Four grains (0.25 g.) might reasonably be regarded as fatal. So far as antimony tartrate is concerned, the amount received by the patient was nearly three times the fatal dose, which lies between 0.01 and 0.02 g. per kilo of body weight, or about 18 gr. (1.2 g.) for an adult. Evidently the treatment given was most effective and saved the patient's life.

Summer Prurigo

Q.—*A young man suffering from prurigo aestivalis develops a papular eruption on the forearms, hands, and face on exposure to sunlight. Itching is severe at times. What is an effective treatment?*

A.—Treatment of summer prurigo is disappointing. The condition is dependent on specific sensitization to certain kinds of light or to ultraviolet rays. A general overhaul is needed with special reference to focal sepsis, gastro-intestinal function, and nutritional deficiencies. Desensitization—by graduated exposure of the whole body to natural or artificial sources of light—is sometimes partially successful. *X*-ray therapy, if assisted by protective measures, gives temporary relief. Occasionally gold therapy, injection of vitamin A concentrates, or nicotinamide by mouth or injection seems to protect, without obvious reason. Applications to prevent the rays penetrating to the exposed skin are generally necessary during daylight. The most effective are petroleum jelly and a titanium dioxide preparation (after its application any excess can be removed with damp cotton-wool). A lotion containing equal parts of calamine, glycerin, and water is of use in mild cases. An ichthyol powder may subsequently be applied. These measures can also be employed in the form of "barrier creams." Alternatively petroleum jelly may be used with an emulsified base or ung. aquosum *B.P.* in equal parts. "Benadryl" has been reported as controlling urticaria due to light-sensitiveness. It would be worth trying in light prurigo.

Treatment of Heart-block

Q.—*A male patient, aged 58, who has a resting pulse rate of 20, suffers from nocturnal feelings of suffocation. Can you suggest any effective treatment?*

A.—A pulse rate of 20, if it is accompanied by a correspondingly slow heart rate, is an almost certain indication of complete heart-block, probably associated in this case with a severe degree of myocardial degeneration which would be likely to cause nocturnal feelings of suffocation. Injections of adrenaline or the oral administration of ephedrine are both of value in certain cases of heart-block, but should not be employed without thorough investigation and consideration of each individual patient.

Effort Syndrome

Q.—*A patient with a history of several years' mental and emotional, and sometimes physical, strain presents the following picture: lack of mental ability; failure of memory, concentration, interest; lack of energy—extreme fatigue induced by slight physical or mental effort, with palpitations. Routine physical examination reveals nothing abnormal. What are the diagnosis and treatment?*

A.—This appears to be a typical case of Da Costa's or "effort" syndrome, investigations concerning which were made in the 1914–18 war by Lewis, and at Mill Hill Hospital and elsewhere during the recent war. The conclusions seem to be that the condition is essentially psychological, or at least emotional. Reference should be made to contributions in this *Journal* (May 24, 31, and June 7, 1941), and in the *Proceedings of the Royal Society of Medicine* (1941, **34**, 541). Constitutional factors, as in many psychosomatic disorders, may play at least some part. In any case the treatment is more difficult than that of other psychoneuroses, and apart from radical analytical treatment little can be done except by gradual rehabilitation.

Suspected Pituitary Deficiency

Q.—*A man of 29 developed normally until about 14 years of age, since when growth has been arrested. His height is now 5 ft. 3 in. (160 cm.); he is thin, pale, with little energy and has no facial, axillary, or pubic hair; the genitalia are infantile in type. He has a normal male voice and his intelligence is not affected. He has frequent erections but no nocturnal emissions. Recently, after injections of testosterone, he felt fitter and more energetic and his testicles doubled in size. He then took testosterone tablets with no effect and his testicles returned to their original size. He is distressed about his condition, as he wishes to marry. Is this advisable?*

A.—There is insufficient evidence to make a definite diagnosis in this interesting case. A response to gonadotrophic hormone would have confirmed the clinical impression of primary pituitary deficiency. Radiography of the pituitary fossa might indicate a pituitary or parapituitary neoplasm. Examination of the fundi and visual fields might prove of interest. Deficient height at the age of 29 favours the clinical diagnosis of pituitary deficiency. It is worth trying gonadotrophic hormone, but the effect both of this and of testosterone is likely to endure only while treatment is continued. Secondary sexual characteristics and potency but not fertility will be enhanced by testosterone. The enlargement of the testicles after testosterone is interesting; they usually remain the same size, as testosterone has no direct

action on them. Marriage is inadvisable unless the condition is fully explained to the contemplated bride and a responsible relative.

Effect of Amphetamine

Q.—*Amphetamine taken before meals seems to reduce the appetite. This might be of benefit in obesity, but would it predispose to gastric ulcer? Is the initial stimulation of the brain followed by depression? Any other pharmacological points would be welcomed.*

A.—Amphetamine has been shown to reduce the appetite of rats. It affects the normal human stomach by first stimulating it so that emptying is hastened, and later inhibiting its action so that emptying is delayed. There is increased pyloric tone, though in spastic states there may be the opposite effect—a relaxation of spasm. Gastric acidity is not appreciably affected by amphetamine. The stimulation of the brain produced by the drug leads to prolonged wakefulness at a time when the subject would normally be recruiting his strength by sleep; thus reserves are exhausted and collapse is common. While some can take the drug for long periods without collapse occurring, others are adversely affected much earlier. Patients receiving amphetamine may complain of flatulence, anorexia, nausea, abdominal pains, and an increase or a decrease in bowel movements.

Phenylmercuric Nitrate and Chloride

Q.—*I would like information about phenylmercuric nitrate and phenylmercuric chloride. What are their possible therapeutic uses?*

A.—Phenylmercuric nitrate and phenylmercuric chloride are powerful fungicides and germicides, and when taken by mouth they exert a strong bacteriostatic and bactericidal effect in the blood, the cerebrospinal fluid, the bile, the urine, and the faeces. They have a low toxicity; for rabbits the minimum lethal dose of the nitrate is 0.01 g. per kilo when given intravenously, and 0.03 g. per kilo by mouth. When 250 ml. of 1 in 1,250 solution (0.2 g.) was taken orally by a human subject the only effect was a rise of pulse rate by 20, though it caused a feeling of astringency in the mucous membrane of the mouth. These substances have no toxicity when applied to the skin, on which phenylmercuric nitrate is used in a strength of 1 in 3,000. This substance is stated to be 78 times as potent against Gram-positive cocci as mercuric chloride. It is useful in ringworm and epidermophytosis (Levine, *J. Amer. med. Ass.*, 1933, **2**, 2108).

Insect Repellents

Q.—*Can you recommend any new insect repellents for topical application for a patient residing in Calcutta who is particularly susceptible to insect bites and stings?*

A.—Dimethyl or dibutyl phthalate rubbed on the skin gives satisfactory protection for several hours against most insect bites. These substances may cause smarting on abraded skin or in the eyes but are otherwise innocuous. They are solvents of many synthetic plastics and consequently contact with plastic watch-glasses, spectacle frames, etc., should be avoided. They may be used alone or incorporated into lotions or creams. They are not repellent but are lethal to mites, and rubbed into clothing are a most valuable protection against scrub typhus.

INCOME TAX

All inquiries will receive an authoritative reply but only a selection can be published.

Assistantship: Expenses

T. started as an assistant in general practice on Jan. 1, 1947; he asks what are the usual expenses which can be claimed.

*** A salary as an assistant is assessable under Schedule E, and the statutory rule is that only those expenses which are incurred "wholly, exclusively and necessarily in the performance of the duties of the office" can be deducted. The main allowable expense is the cost of maintaining and running a car. T. can claim an initial allowance (20% of £295=£59) and wear-and-tear allowance (¼ of 25% of £295=£37) as deductions from his earnings for the quarter from Jan. 1. Any other expenses which he is required by the terms of his engagement to bear can also be deducted—i.e., cost of professional use of telephone. He should get in touch with the local tax office and obtain an adjustment of his present coding.

Letters and Notes

Sir William Macewen

Mr. J. MENZIES CAMPBELL (Glasgow) writes: I recently read, with considerable pleasure and profit, Dr. Harley Williams's book, *Doctors Differ*. Although no one can controvert the austere and autocratic manner of Sir William Macewen, nevertheless I feel that another aspect of his nature should not pass unnoticed. The following incident occurred in the year of Sir William's presidency of the British Medical Association. A friend of mine (an eminent dentist in New York) was spending a golfing holiday at Turnberry. Unfortunately an abrasion in his hand became septic. He journeyed at once to Glasgow and telephoned that afternoon asking me to arrange an appointment for him with the best surgeon. I straightway telephoned Sir William Macewen, who personally answered the call. I explained the circumstances, and no one could have been more sympathetic and co-operative. He mentioned that he was at the moment overwhelmed with business relating to a B.M.A. Council meeting which he was to attend in London next day and for which he was leaving within a few hours. He asked me to request my friend to take a taxicab at once to his house and he would see him. After leaving Sir William the American called to inform me of the great kindness which he had received. Sir William had personally incised the finger and dressed and bandaged the wound. He met the inquiry about a fee with the response, "There is no fee: 'we' were pleased to be of any service to you."

Half Cost, Double Value

Dr. JOSIAH OLDFIELD (London, W.1) writes: Medical men can be of great service at this particular juncture, when fuel is so scarce, by teaching in every house they visit that in order to obtain a hot bath in perfection the ordinary bath should be covered in so as to turn it into a miniature Turkish bath. All that is needed is either to put a small clothes-horse across the bath or even a frame of boards or battens, and to lay over this frame either an old blanket or rug or even a few sheets of brown paper. Space should be left at the head end to slip into the bath, and the half quantity of water will give a more perfect bath by using the hot steam which lies above the water in place of filling the bath up to the usual full capacity.

Marriage Guidance

Dr. PHILIP M. BLOOM (London, W.1) writes: The discussion in the House of Lords last week following the Denning Report was most interesting and certainly a most important peak in our educational history. The proposals of the Government to appoint welfare officers and to give material aid to the various clinics dealing with the divorce problem are most encouraging to those of us who are interested. I feel, however, that too much emphasis has been laid on solving and trying to adjust unhappy marriages rather than preventing them. I desire to put in a strong claim for more pre-marital guidance and instruction. The marriage guidance and similar clinics deal, *inter alia*, with this latter subject, but the importance of it has not been sufficiently stressed. A few young couples are already seeking help and my experience is that they are eager for information. I have no doubt that with encouragement a great many more young people would seek guidance. Pre-marital education and instruction along comprehensive lines go a long way towards preventing the development of incompatibilities and unhappiness in marriage.

Co-opted Members on Negotiating Committee: Correction

Dr. D. H. STUART BOYD writes: The letter from myself (April 5, p. 469) contains an error which I unfortunately overlooked before signing. The phrase "bestowed on the negotiation and election of the Negotiating Committee" should, of course, have been "bestowed on the nomination and election of the Negotiating Committee."

Correction

A typist's slip caused Dr. A. M. Nussey's name to be misspelt in our report of the meeting of the Section of Endocrinology of the Royal Society of Medicine in the *Journal* of April 12 at p. 501.

All communications with regard to editorial business should be addressed to THE EDITOR, BRITISH MEDICAL JOURNAL, B.M.A. HOUSE, TAVISTOCK SQUARE, LONDON, W.C.1. TELEPHONE: EUSTON 2111. TELEGRAMS: *Aitiology, Westcent, London.* ORIGINAL ARTICLES AND LETTERS forwarded for publication are understood to be offered to the *British Medical Journal* alone unless the contrary be stated.

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